Social behaviour of the Golden Snub Nosed Monkey, *Rhinopithecus roxellana*

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I hereby state that the following thesis is my own original work, unless otherwise referenced.

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Abstract:

The Golden snub-nosed monkey, <u>*Rhinopithecus roxellana*</u> Milne-Edwards, 1870*, *exhibits a One male multi female and All male unit based social system. Data were collected on individuals within two groups at The Shanghai Wild Animal Park and a troop at the Zhouzhi National Nature Reserve for the Golden Snub-Nosed Monkey. Individuals showed a significant preference, identified using dyadic-based Chi-squared statistical analysis, for interacting, both affiliatively and agonistically, with certain partners over others. The objective of this study was to construct a working ethogram of this species and use it to compare the social network with those exhibiting predominantly cross-sex bonds, for example, Hamadryas Baboons, and female-female bonds, Gelada baboons. The study also examined the influence of various changes on the social networks, including the loss of an individual, the introduction of a new male, the maturation of subadults, and the birth of infants.*

*Primate species taxonomic details were confirmed from Groves (2001).

Chapter 1: Introduction

Species background:

The Golden snub-nosed monkey, *Rhinopithecus roxellana*, is a predominantly folivorous colobine endemic to the People's Republic of China. Kirkpatrick's (1995) review of snub-nosed monkeys pointed out that little information exists on the social dynamics within groups. This may be due to the harsh environmental conditions within their habitat (Su et al., 1998, Kirkpatrick, 1998) and the previous poor success of captive groups (Poirer and Hu, 1983b). It is known, however, that *R. roxellana* exhibits a multi-tier social structure with subunits consisting of one male multi female units each containing a single adult male plus females and immatures (Kirkpatrick et al., 1999, Ren et al., 1998b) and All male units that exist peripheral to the heterosexual units (Kirkpatrick et al., 1999, Ren et al., 1998b).

While superficially similar to other species exhibiting a multi-level social system containing one male units, such as Hamadryas Baboons and Geladas, Gruter and Zinner (2004) suggested that the snub-nosed monkey groupings were originally OMUs and the grouping into troops came later, in contrast to Geladas and Hamadryas baboons where, they argued, it was actually multi male, multi female groups that eventually split up into OMUs (Gruter and Zinner, 2004).

Reproduction

R. roxellana is a strict seasonal breeder (Zhang et al., 2000, Kirkpatrick, 1995, Ren et al., 1995), but mountings occur throughout the year, with seasonal variations (pers. obs, Ren et al., 1998b). Gestation is approximately 6 months (Zhang et al., 2000, Kirkpatrick, 1995, Chen et al., 1985, Davison, 1982). Table 1 summarises some of this species' reproductive characteristics. Females do not show any obvious signs of oestrus such as sexual swelling (Clarke 1991).

Table. 1. ***Rhinopithecus roxellana*** **reproductive characteristics**

Location	Mating season	Birth season	Gestation (est.)	Reference
Shennongjia	August/October	April/August	7 months	Kirkpatrick (1995)
Wolong	September/ November	April/June	7 months	
Baihe	July/August	March/April	8 months	
Qinling	August/October	March/April	7 months	
Beijing Zoo	August/November (peak sexual activity)	March/May	6.6+/-0.2 (n=4)	
Qinlingshan		March/June		Studies in review of Gruter and Zinner (2004)
		March/April		
Shennongjia	September/ December			
	October/December	April/June		
Captivity		April/May		
	September/ November			
	October/December	March/June		
	October			

Feature	Male	Female	
Mounting #	4 yrs	2.4-3.3 yrs	Liang et al. (2000)
Solicitation	Unknown	2.5-3.7 yrs	
Menarche##	Not applicable	3.2-4.5 yrs	
Reproduction	>6.5 yrs	4.0-6.0 yrs	

Described as copulation for males and mating for females in Liang et al. (2000).

Time of menstrual cycle initiation.

Described as ejaculation for males and birth for females in Liang et al. (2000).

Taxonomy and distribution:

Colobine monkeys constitute a subfamily (Colobinae Jerdon, 1867) of old world monkeys. The genus *Rhinopithecus* contains four species, of which the Tonkin snub-nosed monkey, *Rhinopithecus avunculus*, is found in Vietnam, and the other three species are found in mountainous regions of China: the Guizhou or grey snub-nosed monkey, *Rhinopithecus brelichi*, the Yunnan or Black snub-nosed monkey, *Rhinopithecus bieti*, and the Golden snub-nosed monkey.

The taxonomy of *R. roxellana* remains controversial (Kirkpatrick, 1995). The species could potentially be divided, using the proposed geographic distribution, morphological differences and pelage, into three subspecies, *qinlingensis, hubeiensis* and *roxellana* (Wang et al., 1998). Of the two putative subspecies observed in this study, distinct difference in the pelage were present in some individuals, in particular the younger OBN and OG who exhibited a much more striking orange coat compared to other individuals (*See methodology: study groups*).

Habitat

R. roxellana are found in montane regions (Kirkpatrick, 1998, Bennett and Davies 1994, Kirkpatrick, 1995) of vertical forest zonation (Kirkpatrick, 1998). The habitat ranges from subtropical evergreens to broadleaf and conifer forests (Poirer and Hu 1983b, Kirkpatrick 1995, Kirkpatrick 1998, Bennett and Davies 1994, Su et al. 1998, Kirkpatrick et al., 1999).

The monkeys usually inhabit an altitude range between 1,200 to 3,400 m above sea level (Shi et al., 1982, Poirer and Hu, 1983a, Ren et al., 1998b, Kirkpatrick, 1995, Su et al., 1998, Li et al., 2000). Within a single day, altitudinal changes can be as high as 350 m, though are rarely greater than 100m (Su et al., 1998).

This is one of the most extreme climates for non-human primates (Gruter and Zinner, 2004) with strong seasonal variation (Struhsaker and Leland, 1987, Bennett and Davies, 1994), in particular very cold winters with the longest duration and lowest average temperature for non-human primates (Kirkpatrick, 1995, Happel and Cheek, 1986 *In* Bennett and Davies, 1994).

Home range

Reports of home range size vary, but most studies suggest about 15-55 km^2 (Li et al. 2000, Kirkpatrick, 1995, 1998), perhaps diminishing from summer to winter (Li et al., 2000), and influenced by the seasonal changes in food resources (Gruter and Zinner, 2004, Li et al., 2000).

Population size:

The world population of *R. roxellana*, divided according to the subspecies of Wang et al. (1998), is as follows: *Rhinopithecus roxellana roxellana* the most abundant with possibly

10,000 individuals in 100 groups; *Rhinopithecus roxellana qinlingensis*, 3,000 individuals; *Rhinopithecus roxellana hubeiensis*, 1000 individuals. Kirkpatrick (1998) cited densities of from 1.6 to 11.8 individuals per km^2, and lists the densities reported for other *Rhinopithecus* species as: *R bieti*, 1.1-17 individuals per km^2; *R. brelichi*, 11.4-19.1 individuals per km^2; *R. avunculus*, 3.1-8 individuals per km^2.

Troop sizes:

Troops of *R. roxellana* often contain a very large number of individuals. For example, Poirer and Hu (1983b) report troops of 300-500 animals. Further troop sizes are given below in Table 2. These show high levels of variation even within the same area. Gruter and Zinner (2004) noted a potential area of confusion in definitions of troop versus band, and this could explain some of the variation. Also Su et al. (1998) noted that accurate counts of groups of *R. roxellana* were difficult due to the large numbers involved and wide dispersal. Activity (Ren et al. 1998b), dense vegetation, weather and position of subjects have also been listed as hindrances to accuracy (Su et al., 1998).

Table 2: Comparison of group/troop sizes* (Based on Gruter and Zinner (2004) and studies cited therein, additional sources cited)

Area	Year	Troop Size
Wolong (Sichuan)	1980*	275 (potentially 600)
Baishuijiang (Gansu)	1995*	80
Qinlingshan	2003*	100
Zhouzhi National Nature Reserve		
Yuhuangmiao region, Qinling mountains (Li et al., 2000)	1997**	90 (95% confidence: 65-131)
Zhouzhi (west Ridge)	2003*	90
	2003*	63
	2004*	88
Shennongjia National Nature Reserve		
Hubei province, Dalongtan area (Ren et al., 1998b, Su et al., 1998)	1991-1995**	162, 95, 340, 136, 230
Jinghouling	2004*	2005
Between Xiaolongtan and Yazikou areas	1999**	7
Qianjiaping area	2002*	40-50
Baihe Nature Reserve		
Youfang Valley (Kirkpatrick et al., 1999)	1999**	Approx 200-220: 22 adult males, 55 adult females, 68 juveniles and 29 infants *26 individuals were unidentified*

*date of publication of fieldwork

**date when the fieldwork was performed

Troop compositions

Reports suggest that troops of *R. roxellana* exhibit a strong female bias in their numbers, consistent with the bias reported in other *Rhinopithecus* species, Hamadryas baboons and Geladas. Further results of troop size surveys are included below in table 3.

Table 3. Comparison of *R. roxellana* group composition between sites and studies

Type*	Ratio	Source
Adult male: Adult female	1:2.5	Youfang Valley, Baihe Nature Reserve (Kirkpatrick et al., 1999)
	1:1.6	Qinling mountains (Kirkpatrick, 1998 review)
	1:2.7	
	1:05-2.3	Shennongjia, Dalongtan area (Kirkpatrick, 1998 review)
	1:2.1	Wolong (Kirkpatrick, 1998 review)
	1:1.21	Wolong (Hu et al., 1980 *in* Gruter and Zinner, 2004)
Adult: Immature	1:1.2	Youfang Valley, Baihe Nature Reserve (Kirkpatrick et al., 1999)
	1:0.5	Qinling mountains (Kirkpatrick, 1998 review)
	1:3.0	
	1:0.7-3.2	Shennongjia, Dalongtan area (Kirkpatrick, 1998 review)
	1:0.5	Wolong (Kirkpatrick, 1998 review)
Infant: Adult female	1:1.9	Youfang Valley, Baihe Nature Reserve (Kirkpatrick et al., 1999)

Conservation status of the species:

R. roxellana was listed as Endangered in the IUCN/SSC Action Plan for African and Asian Primate Conservation (Oates and Davies, 1994b); it is considered vulnerable (2000 IUCN Red List, World conservation union) and a first class protected species in China, although much of the protection this species has experienced has been a result of its presence in areas designated for Giant panda conservation (Kirkpatrick, 1995).

Threats to the species include hunting by humans (Poirer and Hu 1983b, Kirkpatrick, 1995), human encroachment, isolation of populations (Kirkpatrick, 1995), and deforestation and habitat destruction (Ren et al., 1998a, Struhsaker and Leland, 1987, Kirkpatrick, 1995). Predation has rarely been documented in this species, and many of the potential predation events are probably cases of scavenging (Zhang et al., 1999). Zhang et al. (1999) documented an event where a juvenile *R. roxellana* was taken by a goshawk.

***Rhinopithecus roxellana* social system:**

A *R. roxellana* troop can be considered a combination of a number of smaller social groups, the subunits. In the literature, these subunits have been described as one male units, OMUs (Poirer and Hu 1983b, Kirkpatrick et al., 1999, Ren et al., 1998b, Kirkpatrick, 1998, Kirkpatrick 1995), all male or multi male units, AMUs (Ren et al., 1998a, Kirkpatrick et al., 1999, Kirkpatrick, 1998) and multi-male-multi-female units (Kirkpatrick et al., 1999, Ren et al., 1998b). During rest or feeding, these sub groups can be distinguished from the rest of the troop by the criteria described by Struhsaker (1979), in particular their composition and close proximity to each other within the social subunits and the distance from others without, usually 5-10 meters (Ren et al. 1998b).

Social subunits

One Male Units

An OMU consists of a single adult male and a number of adult females, possibly with juveniles and infants (Kirkpatrick, 1995, Poirer and Hu, 1983b, Ren et al., 1998b, Kirkpatrick et al., 1999). Ren et al.'s (1998b) study of *R. roxellana* in Shennongjia National Nature Reserve gave the average number of individuals within an OMU as 12.

All Male Units

The second of the two commonly cited social subunits is the all male unit or AMU. AMUs comprise adult, subadult, and possibly juvenile males (Ren et al., 1998b, Kirkpatrick et al., 1999). All male units can often be seen on the periphery of the troop (Kirkpatrick et al., 1999, Kirkpatrick et al., 1998), acting as frontal vanguards during marching progressions (Ren et al., 1998b), or as sentries to the troop (Kirkpatrick, 1998). Ren et al. (1998b) reported the common number of individuals in the all male units in Shennongjia as 4-7.

Juveniles/infants

When the troop is at rest or feeding, aggregations of juveniles and infants can be seen playing with each other, and juveniles of different OMUs will congregate together and play (Ren et al. 1998a).

Interactions between subunits

Studies have noted intolerance and aggression between the social subunits (Newton and Dunbar, 1994, Poirer, 1974). Males are known to become aggressive towards each other in the presence of females (Poirer, 1974).

Individual interactions

Social interactions are a structuring feature of primate populations, and primates expend a lot of energy on the development and maintenance of their social relationships (Stammbach, 1987). The social system expressed by a group can be considered in terms of the network of events, both positive (affiliative) and negative (agonistic), that are exhibited by its constituents (Colmenares, 2004). This would be further emphasised by the extreme environment of *R. roxellana* which restricts the time available for social interactions (Dunbar 1983b), forcing the monkeys to be highly selective in their choices.

Male-Male interactions

Within and between the OMUs there is little evidence of male-male interaction beyond aggression, yet the presence of AMUs suggests some form of attraction between the males (Kummer 1979 based on a study by Sugiyama, 1966, Poirer, 1974), possibly the inherent benefits of being a member of a group, but this attraction degrades when females are present (*see above*).

Male-Female interactions

There has not been a great deal of research performed on cross-sex relationships in colobine monkeys although female-male grooming was reported not to be different from random (Kirkpatrick et al., 1998).

Female-Female interactions

Newton and Dunbar (1994) proposed that the majority of colobine species were similar to other old world monkeys in that female bonds (matrilineal) are the basis of their grouping, although female relationships may be very subtle and infrequent. This might be in part due to the "scramble" feeding habitats of colobines (feeding from large abundant patches compared to foragers who feed on small, dispersed patches), diminishing feeding related interactions and the need for alliances or coalitions to ensure they obtain the required resources (Barton et al., 1996). Although *R. bieti* does experience low food competition, the females appear to be socially active: they groomed and were groomed more often than expected and spent more time in each other's proximity, suggesting the presence of female bonds and relationships (Kirkpatrick et al., 1998).

Multi level social structures in other species:

Baboons

Hamadryas baboons and Geladas have been studied in much greater detail than *R. roxellana*. Table 3, adapted primarily from Gruter and Zinner's (2004) review, summarizes some of the key features, selecting geladas and Hamadryas baboons for comparison to *Rhinopithecus roxellana* for a number of reasons:

-- All three species also travel and forage in groups (Swedell, 2002),

-- Gelada and Hamadryas express superficially a similar social structure to *R. roxellana,*

-- All three species exhibit a multi tiered social structure and large troop sizes (Gruter and Zinner 2004);

-- All have a restricted range and are large bodied with distinct dimorphism between the sexes (Gruter and Zinner, 2004).

Gelada and Hamadryas, although recent reports suggest some variation, maintain their social system with strikingly contrasting forms of social bonds.

Snub-nosed monkeys, Hamadryas baboons and Geladas all have adapted to an extreme environments (Gruter and Zinner, 2004), and this is important when considering social structure because a certain amount of resources must be consumed each day to meet energy needs. In extreme environments, acquiring this amount takes longer and less time is available for social interactions (Dunbar 1983b, 1984). Geladas, for example, can spend up to two thirds of their time foraging (Dunbar 1984).

While recent studies and articles have suggested a previously unreported level of variation in their social structure (for example Swedell, 2002, Gore, 1994), the relationships that form these Hamadryas and Gelada social networks have been used to assemble two theoretical social systems based on the one male social grouping. Hamadryas baboons' social structure results from strong male-female bonds within the OMU with a dominant male, while Geladas exhibit strong female-female bonds within the OMU and contain a dominant female (Stammbach, 1987, Gruter and Zinner, 2004). It should be remembered that, even though each species expresses different rules of social engagement, the “ultimate functional considerations" remain the same (Dunbar 1983b), considerations that *R. roxellana* must also adhere to. Geladas and Hamadryas baboons therefore represent opposite ends (with variations) of the same continuum for multi-tiered social systems containing OMUs. It is likely that *R. roxellana* will obey rules of social preferences fitting somewhere on this continuum as well.

It was the overall aim of this study to identify where on this "continuum" *R. roxellana* social structure resides.

Table 8: Key features of Gelada and Hamadryas baboons (Based on (Gruter and Zinner 2004) and studies cited within, additional sources cited)

Characteristic	Hamadryas Baboons	Geladas
Distribution	Northern Ethiopia and Red Sea coasts of Sudan, Somalia and Arabian peninsula; Eritrea (C. Groves, pers.comm.; studies *in* Stammbach, 1987).	Ethiopia.
Habitat	Arid savannahs, semi-deserts and wooded to sub desert steppes (Stammbach, 1987) Use cliffs and ledges for sleeping sites (Stammbach, 1987).	Harsh mountainous grasslands with little tree cover and distinct gradients in climate and vegetation. Habitats contain abundant sleeping sites such as cliffs (Stammbach, 1987). Low ambient temperature (Dunbar, 1984).
Altitude range	0-3000 m asl. (Kummer, 1995 *in* Colmenares, 2004).	1400-4500 m asl. 2,000-5,000 m asl. (Stammbach, 1987). Dunbar (1984) noted they do not occur below 1500 m asl.

Characteristic	Hamadryas Baboons	Geladas
Diet/feeding behaviour	Omnivorous (Colmenares, 2004). Dispersed food source (Colmenares, 2004). Potentially water limited (Colmenares, 2004).	Graminivorous: mainly grasses, rhizomes and roots. Grasses are predominantly uniform and dispersed resources theoretically encouraging scramble as opposed to contest competition (Dunbar, 1984). Evenly dispersed and abundant food source (Colmenares, 2004), though with strong seasonal and geographical variation. Some areas can be considered rich in food and drinking opportunities.
Predator pressure	Varied reports: potentially very high to not abundant (Colmenares, 2004).	Varied reports: minimal but have been high in the past to high (Dunbar, 1986 *in* Colmenares, 2004).
Ranging behaviour	30 km^2 (overall), 7.5 km daily.	1-2 km^2.
Pop density*	1.8-3.4/km^2 (Stammbach, 1987).	63-77.6 km^2 (Stammbach, 1987, Dunbar, 1984).

Characteristic	Hamadryas Baboons	Geladas
Social organisation	Multi level social organisation: Troop, Band, Clan, OMU. No AMU reported within bands. Paternal bonds primary source of social cohesion (Colmenares, 2004).	Multi level social organisation: Herd, Band, Team, OMU. AMU reported within bands. Maternal bonds primary source of social cohesion (Colmenares, 2004).
Playgroups	Infants/young cross social boundaries to form temporal “crèches”.	Infants/young cross social boundaries to form temporal “crèches”.
Fission/fusion	Clans and sometimes single OMU regularly “split off”, and separate social groups combine at sleeping sites.	Social fluidity high: OMUs leave/return regularly. Major fission: 8-9 yrs.
Interband relationships	Actively avoided other bands. May form temporary “groups” within band to defend females from other bands.	Band composition very fluid: possible no individual recognition or interaction outside OMU.
Birth seasonality	No (Stammbach, 1987).	Yes, but possibly not strict (Dunbar, 1980 *in* Stammbach, 1987).
External signs of oerstus	Yes (Stammbach, 1987).	Yes (Stammbach, 1987).

Characteristic	Hamadryas Baboons	Geladas
Mating system	One male-multiple females mating system with harem defence polygyny and sequential polyandry (Colmenares, 2004).	One male-multiple females mating system with harem defence polygyny and sequential polyandry (Colmenares, 2004).
Sexual dimorphism	Yes.	Yes.
Alloparental care	Rare.	Rare.

Hamadryas baboons **(***Papio hamadryas* Linnaeus, 1758)
Subfamily: Cercopithecinae,

Diet

Hamadryas feeds predominantly on leaves, flowers, beans, berries and fruit (Stammbach, 1987). The areas this species inhabits could be considered poor in viable resources (Gruter and Zinner, 2004). Direct food competition appears to be rare (Swedell, 2002), suggesting a form of scramble food competition.

Social structure:

The multi-level structure of Hamadryas baboons can be broken down to three or possibly four levels of diminishing size but increasing social interaction, with OMUs being the primary social unit. These come together into socially interacting Clans (Colmenares, 1992, Stammbach, 1987) of genetically related males and their OMUs and, while females may transfer between Cclans, males rarely leave the natal clan (Kummer, 1984). Clans congregate into foraging and travelling groups called Bands (Gruter and Zinner, 2004, Stammbach, 1987). Sleeping site congregations of multiple bands are called Troops (Gruter and Zinner, 2004). It is generally assumed that a troop is not a large cohesive social group; instead, troops result from a number of independent bands converging on rare sleeping sites (Gruter and Zinner, 2004).

One male units

The basic Hamadryas OMU consists of a number of females along with their offspring and a primary male (Stammbach, 1987, Gruter and Zinner, 2004, Colmenares, 1992, Swedell, 2002).

Within the OMU, it has been reported that female-female bonds are weak or non-existent and OMUs often exhibit a more "star" shaped social structure with a socially central male, even though the ancestral form of this social group may have had stronger female bonds (Swedell, 2002). More recently, Swedell (2002) reported the existence of strong relationships between females, though there was variation in the time each female spends with the male and other females, possibly depending on the size of the group and kinship (Swedell, 2002). Overall, Swedell (2002) proposed that while female-female grooming patterns were higher than expected, female-female interactions were still not as much as calculated based on social availability, suggesting stronger female-male bonds. Female tenure within OMUs are shorter than those observed for males (Stammbach, 1987), suggesting that any benefits from non-kin based relationships would have to be received in the short term for females.

Surplus males: Solitary and peripheral males and All male troops

Surplus males may coexist within the population in two ways. Firstly, they may remain associated with the OMU as peripheral males. This is a strategy often adopted by young males, classed as followers (Stammbach, 1987, Kummer, 1984), or ousted old males, classed as deposed leaders (Swedell, 2002). The relationship of peripheral males with the rest of the OMU may be limited to spatial proximity, though other studies have suggested that the male can be a grooming partner for some females, particularly a deposed leader towards their offspring (Stammbach, 1987) or young females, if a follower (Stammbach, 1987). Males have also been reported to kidnap juvenile females from OMUs to start their own unit (Kummer, 1984). AMUs are not common for Hamadryas baboon troops containing females, instead, some males may completely separate from the bisexual troop and form their own all male troop (Gruter and Zinner, 2004). This potentially allows the males to experience the benefits of group living or form coalitions to assist in the take over of OMU (Gruter and Zinner, 2004).

Individual interactions

Male-Male

Strong male-male bonds are thought to exist in Hamadryas baboons (Stammbach, 1987), and because of this there is often more interaction between males than seen in Geladas, and it is possible to identify a linear dominance hierarchy (Stolba, 1979 *in* Gruter and Zinner, 2004). Troop movement is based on the decision by males within a clan (Stolba, 1979 *in* Gruter and Zinner, 2004).

Male-female

The areas this species inhabits contain dispersed and sparse resources (Swedell, 2002). The presence of a dispersed food resource base limits the influence of food competition (Foraging), particularly for females, and removes one of the major forces encouraging female-female bonds; this may free females to focus on the male as a potential partner (Barton et al., 1996). Hamadryas baboons show little in the way of female bonds, instead the OMU is kept together by the male' s efforts towards keeping group cohesion, including a combination of aggressive herding (Gruter and Zinner, 2004), coercion of the females, and cross bonding between the male and females (Swedell, 2002). It appears that each female interacts primarily with the male (Gruter and Zinner, 2004). Females appear to groom and be groomed approximately equally, while males do not groom females as much as they groom him (Sigg, 1980 *in* Stammbach, 1987). The male occupies the highest rank in the hierarchy and the females form a linear hierarchy beneath him. The male-female preferences, at least in one population, seemed influenced by the females' reproductive state; in particular, those without infants and undergoing oestrous cycles are preferred by the male, though this may in fact be due to female actions (Dunbar, 1983).

Studies of captive groups of hamadryas females report that they orientate themselves socially with a dominant female being central, taking the role of the absent male and the other females in competition for access to the “pseudo male” (Swedell, 2002). This suggests that it might not be the actions of the male that creates the star shaped social structure, if females, without the influence of a male, still form such a social network even when the male is not present (Swedell, 2002).

Female-Female

Females do not displace one another in fights over food (Swedell, 2002) and it has not been possible to construct a dominance hierarchy for the females, as there were not enough interactions and the data that were collected did not show a consistently unidirectional trend. Both these factors suggest there is little food competition within the hamadryas OMU; without food competition, female-female relationships can remain unimportant and poorly defined (Wrangham, 1987). Aggressive interactions between females do occur but were predominantly over grooming access to the male (Swedell, 2002). Gore (1994) pointed out that if, in aggressive interactions, a hamadryas female did enlist another individual for support, it was usually the male rather than another female.

Alternatively, Gore (1994) and Swedell (2002) proposed that female-female relationships in this species have, in general, been overlooked because of the subtlety of their behaviour. Reports suggest that linear dominance and distinct grooming relationships occur in captive groups and females will cross OMU boundaries to groom another female (Swedell, 2002). This does not discount the concept of the star shaped social system previously described because, even though a female may spend as much time with other females as with the unit male, taking into account the number of females present shows that she spends less time on average with each available female compared to the time spent with the male (Swedell, 2002).

Females disperse in this species usually as subadults or possibly even as adults (Stammbach, 1987). Females' transfer behaviour is usually limited to movements within the clan, but sometimes they can also move between bands (Gruter and Zinner, 2004). Stammbach (1987) and Swedell (2002) concluded that females will join other OMUs with relatives already present and the genetic relationship of females within the OMU was still higher than expected at random, supporting the concept of some form of female-female attraction.

Swedell (2002), who also reported the presence of female-females bonds in this species, pointed out that OMU size, as well as food distribution conditions, were different in her study compared to previous studies. Female-female interactions are lower in smaller groups and variations in food availability may potentially favour contest over scramble competition.

Geladas (*Theropithecus gelada* Rüppell, 1835)
Subfamily: Cercopithecinae

Social system:

Geladas express a multi level social structure comprising a number of OMU and AMUs (Gruter and Zinner, 2004, Dunbar, 1984). Gelada OMUs are extremely stable (Dunbar, 1979). Surplus males may remain with OMUs or form AMUs (Stammbach, 1987).

Groups of OMUs and AMUs form bands whose composition is not constant (Gruter and Zinner, 2004, Dunbar, 1984) but may exhibit social relationship between some OMUs and AMUs (Mori, 1979e) possibly based on kin relationships (Gruter and Zinner, 2004), described as Teams by Kawai, et al., 1983 *in* Dunbar, 1984. Movements of bands and teams show little organisation, suggesting that outside the OMU social group there is little in the way of coherent social networks, and each OMU remains socially isolated from other members of the band (Gruter and Zinner, 2004, Mori 1979e), except for rare agonistic events and spatial proximity of teams. The term Herd is used to describe the spatial grouping of bands though there may not be any social interaction between the bands besides proximity (Dunbar 1984). Herd development appears not to be for social interactions but is the result of congregations near food resources (Stammbach, 1987, Dunbar, 1983a); even so, in some herds, the membership appears to be stable (Ohsawa, 1979).

One Male units

Gelada OMUs are larger than those of Hamadryas baboons (Gruter and Zinner, 2004) and OMU females may cross social boundaries (Stammbach, 1987). OMUs have been reported to be comparatively bigger in areas where hunting (predation) occurs, than in places without this pressure (Dunbar, 1982). Unlike Hamadryas, there is a clear linear dominance hierarchy with matrilinear determination (Gruter and Zinner, 2004, Dunbar, 1984, Mori, 1979e, Stammbach, 1987) and mother-daughter coalitions (Dunbar, 1984).

It has been suggested that the OMUs are characterised by strong female-female bonds, potentially kin based (Dunbar, 1979, 1982); and male-female relationships are restricted to agonistic interactions (Mori, 1979e). Stammbach (1987) suggested that the OMU's cohesion is due to the alpha female and not the male. The male does not influence the female hierarchy (Dunbar, 1984), instead he appears to remain socially peripheral (Stammbach, 1987); overall he does attempt to interact with a large number of females, even though they do not attempt to interact with him (Dunbar, 1983c).

Even if the male is lost, the OMU remains stable (Stammbach, 1987). A second male may be present, though his relationship with the unit females is usually weak (Mori 1979b, e).

AMUs

Males, upon maturation, disperse from their natal OMU to join the AMUs (Mori, 1979e, Stammbach, 1987), or act as “free-lancers”: by remaining solitary or associated with a band of OMUs (Mori, 1979c).

Individual interactions

Male-Male

There is very little male-male interaction (Gruter and Zinner, 2004) and it is unknown whether dominance ranking exists between the males of different OMUs (Gruter and Zinner, 2004). When there is more than one male in an OMU, there is a clear dominance-submissive relationship, though they might cooperate against external sources (Mori, 1979b).

Female-Male

The male does not appear to differ as a social partner, particularly in grooming, from any of the females (Dunbar 1983c, 1984), and the removal of the OMU's male and the introduction of a new male has been reported not alter the majority of the social relationships (Mori, 1979d, Dunbar, 1979). The male generally interacts with only one female and this is usually a female without other female partners (Dunbar, 1983c, 1982, 1984), though this is not exclusive. In newly formed OMUs, the male has a more centralised position within the social network, but gradually becomes marginalised as the unit develops (Gruter and Zinner, 2004, Stammbach, 1987).

The alpha female can monopolise the male but appears to prefer other females, suggesting that the male is a less desirable alternative to other females (Dunbar, 1984). This might be because the tenure of the Gelada male is short; even though theoretically the male would make a good partner, he is of little use in coalitions because of this rapid turnover, meaning that, as a long term partner, he is less attractive (Gruter and Zinner, 2004, Dunbar, 1983c 1984). The "apparent" lack of male attraction could be a by-product of the OMU larger size as there is on average, less individual access to the male per female, or because, compared to Hamadryas baboons, gelada females within the OMU are more closely related so have a greater value as a partner (Gruter and Zinner, 2004).

There may be some variation, however, as Mori (1979e) noted a “special and intimate” relationship between the alpha female and the male in geladas, and the male showed a preference for oestrus females. Dunbar (1984) reported that it was the most dominant (high-ranking) females without partners, possibly also the oldest that were the males’ partners.

Fights between females are rarely interrupted by the male and, although herding by the male on females has been reported, particularly towards newly matured females (Mori 1979c), it is ineffective and can result in female aggression (Dunbar 1984). Instead, the male actively uses affiliative behaviours to maintain unit cohesion (Mori 1979e).

Mori (1979d) and Dunbar (1984) reported, in some OMUs, the presence of a second subordinate male who might maintain an affiliative relationship with a number of females and may assist in group defence, though rarely as intensely as the primary.

Female-Female

The female-female bonds appear to be the strongest form of affiliative relationships in this species and are based on kinship (Dunbar 1979, 1982, 1983b); females are the non-dispersing sex and predominantly remain in their natal group for the entirety of their life (Gruter and Zinner, 2004). The females within OMU exhibit a dominance hierarchy (Mori, 1979e) which appears to be a linear (Dunbar, 1984), and based on matrilineal connections (Stammbach, 1987). These bonds are so strong that Dunbar (1979) tested it against a number of events known to be disruptive within other species -- oestrous, birth, death, takeover -- and found no disruption. Even over the long term, the stability of the unit and female bonds remained constant. This supports the model of the kin basis of the bonds, because kin relation was the only factor that remained constant over the entire temporal scale (Dunbar, 1979).

Females may interact with kin, but it is only the close kin within the immediate matriline they affiliatively interact with, even selecting these individuals over higher ranking monkeys (Dunbar, 1983b). Grooming partnerships are limited to one or two females (Dunbar, 1982, 1983b), suggesting that they do not groom kin indiscriminately, instead grooming only one member of the matriline preferentially, usually the mother or daughter (Dunbar, 1979) If one partner dies another may not take her place (Dunbar 1983b, 1984). Females without mature kin may spend their time grooming their immature offspring (Dunbar 1984).

Objective of this study

While a number of studies have been reported, particularly recently, that describe the social system on the level of the OMU (for example Zheng et al, 2006, 2008), no study has identified the social dynamics of individuals within the Golden snub-nosed monkey, *Rhinopithecus roxellana*, in depth and with multiple behavioural categories. Further documentation of individuals' behaviour is required to fully understand the nature and all aspects its multi-tiered social system. The objectives of this study are to:

1. Construct a viable ethogram of social behaviours based on previous studies of this species, closely related species and key species for comparison and evaluate its strengths and weaknesses.
2. Utilise this ethogram to identify whether the individuals were selecting partners to interact with at random or showing some preference for one or more individuals over others and identify potential causes of these relationships.
3. Utilise the identified relationships and potential causes to establish whether this species could be considered predominantly Female or Cross sex bonded.
4. Compare the basis of the social system (Female versus Cross sex bonded) to those of Hamadryas baboons and Geladas.

Methodology Section 1: Behavioural events

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Summary

In this section of the methodology, the following is included:

1. *The study's assumptions: Measurable differences, selective partners, Preference/relationship correlation, temporal insensitivity, independence, third party influences and free access,*
2. *Identification of the initiating monkey,*
3. *The selection criteria for Behavioural events: An end event, a discrete and obvious unit of behaviour and interactive in nature,*
4. *Potential errors in identifying relationships due to other parties' involvement: Ghosting and Greater than dyadic relationships,*
5. *Operationally descriptions of the Behavioural categories and event types* and*
6. *An explanation of the relationships between Behavioural events.*

***** During the course of the study, data was collected on Behavioural events that could not directly be classed as either being representative of an Affiliative or Agonistic relationships were also collected (*see results*). These included Glance events, Self groom, Mounts and Other events. The results of this are included in the relevant areas of the text.

Assumptions

A number of assumptions were made in this study, as listed below.

1. **Time restrictions for interactions:** The subjects had a finite amount of time, despite the artificial feeding regime decreasing the required foraging time, to devote to social interactions (Dunbar, 1983, Watts, 2000a, 2000b). Therefore, the subjects would be selective in their interaction partners.
2. **Measurable differences:** Social relationships manifested themselves in measurable differences in the Behavioural events between individuals.
3. **Affiliative, Agonistic and Other behaviours:** Behavioural events are affiliative or agonistic in nature. Events that are ambiguous, but social (or potentially) in nature, were considered "Other" events.
4. **Correlation of preference and relationship:** The preferential manner by which individuals were selected to interact with compared to others available was representative of the relationship strength between them.
5. **Daily temporal insensitivity:** Daily temporal factors did not play a significant role in the Behavioural events. This assumption is unlikely to be upheld as previous studies have highlighted the importance of temporal factors in the number and pattern of interactions observed (Harcourt, 1978). Constraints on this study did not allow for their inclusion. The influence of the artificial feeding regime and other factors would probably result in analysis of temporal influences being flawed.
6. **Independence:** The Behavioural events occurred independently; however, see Watts (2000a); Kappeler and van Schaik (1992); Stevenson (1998); Matheson and Bernstein (2000b) and Hinde (1983). By definition, Reciprocal groom was not independent from the original Single groom event. For Reciprocal groom events, therefore, the assumption of independence was relaxed.
7. **Third party influences:** Behavioural events were scored in a dyadic fashion, and data analysis focused on dyadic associations with the assumption of independence from third party influences, similar to the method utilised by Parr et al. (1997). A number of studies have made reference to this or similar assumptions and the effect on the data including Cheney and Seyfarth (1999); Silk (1999); Matheson and Bernstein (2000); Watts (2000) and Judge and Mullen (2005).

8. **Free access:** Subjects had unhindered access to interact with any other subject present within the study site. This assumption was closely related to third party influences (cf. Seyfarth (1976, 1995) *priority of access* model, also Sambrook et al. 1995).

Initiation of the Behavioural event

The initiator of a Behavioural event was identified as the subject who put the initial effort within the event (cf. Rowell, 1966, Behavioural events as continuous series). Effort was required for a subject to be listed the initiator. Behavioural events where the initiator could not be identified were scored as an "unknown initiator". The ending of a Single groom event, for example, with one of the subject shifting position was scored with the "shifter" as the initiator of the following Proximity event, if one occurs; if neither moved, or both were observed to move, the event was classed as a Proximity event with an unknown initiator.

Selection criteria

The criteria for identifying and categorising Behavioural events was created to conform to the definition of behaviour as stated by Chance (1967). Behavioural events had to be visible and interactive in nature (with the exception of Self grooming). The underlying motive was not considered in the behavioural event classifying actions (Rowell, 1966), creating limited, but functional based, definitions that were less prone to Observer interpretation bias.

Swedell (2002) suggested that certain Behavioural events, such as locomotion, eating and drinking should not be included in studies of social behaviour of primates, because, along with the limitation of low visibility as these are considered "subsistence activities" and the social network of the subjects might not influence these. However, while subsistent activities may not be influenced, associated Behavioural events, such as which monkeys the focal subject is in the proximity of when feeding may be. For this reason, Behavioural events were scored throughout the day including during "subsistent activities".

The Behavioural events selected had to meet three criteria:

1. **End event:** The scored Behavioural event was not an incidental effect of another action. For example, if a subject walked through another subject's proximity bubble (*see below*), this was not scored as a Proximity event unless the "walking" ended in proximity.
2. **Evident and relatively non-subtle units of behaviour:** Behavioural events were selected so as be unlikely to be misidentified and actions that could be considered cryptic from the point of observation were not included. Leinfelder et al. (2001) suggested that obvious behaviours, such as grooming, allow for reliable documentation of their frequency under observation (see also Silk et al., 2004)
3. **Discrete units of behaviour:** Grades within a Behavioural event were not discriminated, such as length of a Chase event or time spent in a Groom event.

A selection of Behavioural events was created from previous studies of social behaviour in primates, especially, but not limited to *R. roxellana*, and fitting the selection criteria. These were tested during the preliminary trials, a period also utilised to allow the animals to habituate to the observer, at Shanghai Wild Animal Park (SWAP) using the Playground group (for explanation *see Study group section*), for approximately 12 hours.

Behavioural events that were unreliable in the field test were either modified or removed. For example, original Proximity event scores were to include lengths greater than arm length, similar to Gruter's (2003) study of *Rhinopithecus bieti*, but the increased number of subjects requiring observation under such a regime led to an unacceptable level of error in scoring (*see Proximity event section*).

The clumped nature of food availability, compared to the dispersed pattern of naturally occurring food items, made food sharing events an unreliable Behavioural event to score as it was possible that the comparatively (to the wild) poorly dispersed large quantity food items present over a short period made sharing involuntary. The keepers' efforts to ensure all subjects had access to food also hindered the reliability of scoring of this Behavioural event.

Potential errors

Behavioural events were assumed representative of dyadic associations. It was assumed that the behaviour of a third subject did not influence the actions of the first two subjects

Ghosting: potential error

A potential area for error is "ghosting". Ghosting occurred when one subject *appeared to have a relationship* with another due to their interactions with a third party. A hypothetical example of this would be if Subject B and C both have a proximal relationship with subject A, therefore subject B and C are often found in proximity of each other though their intention was to remain in proximal range of subject A. In this example, the decreased radius used for Proximity event scores would diminish, but not exclude, the likelihood of this occurring. The most likely Behavioural events affected by this were Proximity, Body contact and Glance events.

"Greater than dyadic" relationships: potential error

The analysis of Behavioural events as a dyadic relationship means that the influence of the some social constructs, such as coalitions, are ignored. To explain how this would affect the data collections see the hypothetical situation described in the table 1.

Table 1: Example of "Greater than dyadic" relationships.

Actual relationships	Affiliative: Subject A and subject C Agonistic: Subject B and subject C
Behavioural events documented	Subject C grooms subject A (Single groom event)* Subject B wrestles subject C (Wrestle event)*
Subject A response	Subject A chases subject B (Chase event)*
Relationships representation in Data collection	Affiliative: Subject A and subject C Agonistic: Subject B and subject C **Subject A and subject B**

Explanation: Subject A may not have a Agonistic relationship with subject B but does have a Affiliative relationship with subject C. Subject B may have a Agonistic relationship with subject C which manifests itself in subject B initiating a Wrestle event with subject C. Because of the relationship of subject A and C, subject A may become involved in Agonistic interactions with subject B not because of the presence of a Agonistic relationship but due to subject A assistance to subject B. This limitation is unfortunate but unavoidable as taking into account all potential combinations within each interaction would result in an unacceptable number of categories for analysis at this point of mapping of the species social networks.

**For classification of Behavioural events as representative of Affiliative and Agonistic relationships, see appendix, for the above example; it is assumed that a Groom event is representative of a Affiliative relationship while Wrestle and Chase events are representative of Agonistic relationships.*

Behavioural categories/event types

The Behavioural events documented in this study are listed in table 2. A small number of the Behavioural events required modification for use in the Zhouzhi National Nature Reserve due to the different conditions for observations, in particular the lower visibility.

Table 2: Behavioural events selected

Behaviours	**Behavioural event types**	**Brief explanation**	**Study sites used**
1. Look.	Glance (Film 1: Attached CD).	Actively looking in the direction of another subject(s).	SWAP; though see elsewhere on limitations with the Caged female group.
	Stare.	Extended glance with facial expression.	

Behaviours	Behavioural event types	Brief explanation	Study sites used
2. Proximity.	Proximal move (Picture 1).	Move within arm reach of another subject.	SWAP and Zhouzhi National Nature Reserve (ZNNR).
3. Body contact.	Greater body contact (Picture 2).	Greater than 20% body contact.	
	Lesser body contact (Picture 2).	Less than or equal to 20% body contact.	
	Embrace (Picture 3).	Ventral body contact fitting criteria listed.	
	Hold lumbar (Picture 4).	Dorsoventral grasping of another subject's lumbar.	
	Tail grab.	Holding another subject/s tail.	
4. Mounting.	Copulation (Film 2: Attached CD, Picture 5).	Male on female mounting.	SWAP and Zhouzhi National Nature Reserve (ZNNR).
	Pseudocopulation (Film 3: Attached CD).	Male on male mounting.	
		Female on male mounting.	
		Female on female mounting.	

Behaviours	Behavioural event types	Brief explanation	Study sites used
5. Grooming.	Single groom (Film 1 and 4: Attached CD, Picture 6).	Grooming another subject.	
	Reciprocal groom.	Grooming an allogrooming partner.	
	Self groom (Picture 7).	Grooming directed towards the subjects own body.	
6. Approach-retreat.	Walk (Film 5 and 6: Attached CD).	Displacement at normal moving pace.	
	Run.	Displacement at fast moving pace.	
7. Chase.	Film 7: Attached CD	Extended approach (run)-retreat.	
8. Lunge.		Forward body motion towards another subject.	
9. Wrestle.	Film 8 and 9: Attached CD	Extended period of combination of Pull, Push, Grab, Slap	
10. Steal food.		Acquiring the possession of another subject's food.	SWAP, not observed in ZNNR.

Behaviours	Behavioural event types	Brief explanation	Study sites used
11. Rare.	Pull.	Behavioural events with a low frequency of being observed.	SWAP and ZNNR.
	Head pull.		
	Fur grab.		
	Arm grab.		
	Slap.		
	Face grab.		
	Head butt.		
	Push.		
	Head push.		

Operational definitions and explanation of Behavioural events

The diverse range of Behavioural events scored in this study and the use of continual observation required precision and speed of scoring. A number of Behavioural events were modified from standard ethograms. This was done because other ethograms were species specific and required adaptation to fit *R. roxellana,* or that the new definition was less prone to miss-scoring, either due to the capabilities of the observer, dimensions of the study sites and/or other factors involved in this study.

1. Look events

Look events could only be identified when performed by the focal subject. Look events were not recorded in the ZZNNR for three reasons; firstly, inadequate visibility on many occasions. Secondly, it was impractical to identify the large number of individuals within the focal subjects assumed line of sight and finally the need to avoid loss of visual contact with the focal subject, particularly for data collected on individuals identified only to the level of age/sex class.

1.1. Glance events

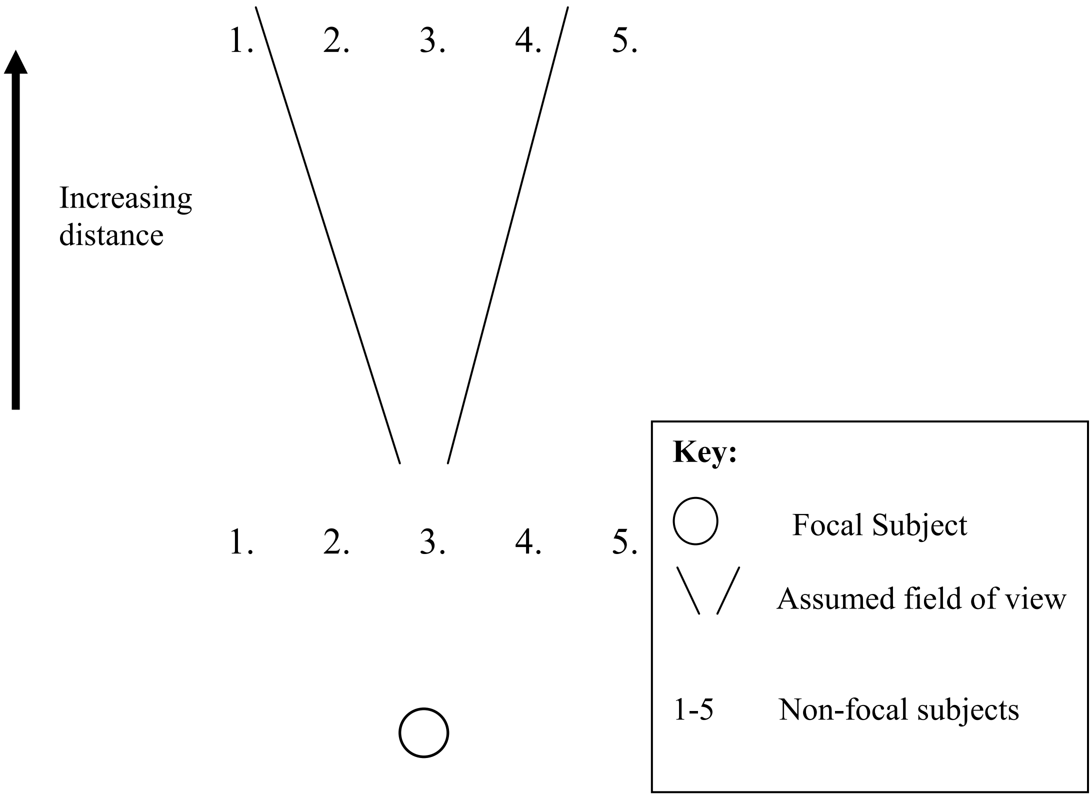
A Glance event was scored when the focal subject physically shifts their gaze, identified by a change in the head position, so that a subject or subjects were newly within the assumed field of view. Examples of Glance events are shown in Film 1: Groom event (at approx. 10, 16 and 27 seconds).

Potential areas of Error

There were five potential areas of error when scoring Glance events:

1. **They could potentially encompass a number of subjects**. It was unknown whether the Glance event was to all or a sub portion of the members within the assumed field of view (an example of Ghosting). Glance events aimed towards a subject further away involved a wider (assumed) field of view that could encompass a larger number of subjects than glancing events towards subjects closer. *See figure 1.*

Figure 1: Assumed field of view



2. **The focal subject's field of view was estimated** by the observer.
3. It was assumed that all subjects had the **same vision capabilities** and that these are the same as for the observer, if in the position of the focal subject.
4. **Subjects who were lost from** visual contact of the observer were not included in being within the focal's assumed field of view.
5. Glance events may have been missed:

   a. The time frame of the glance events may be too short,

   b. The lack of a change in the before and after posture, and spatial positioning of the focal subject, Glance events may only involved eye moment, which were almost always missed,
6. Some areas of the study sites were difficult to observe whether the subject was glancing or not.

Relationships to other Behavioural events

Glance and Stare events could occur simultaneously with other Behavioural events, though Glance and Stare events could not occur simultaneously. Glance events aimed towards a subject being groomed or whose lumbar was being held by the focal were not considered separate Behavioural events and were not scored.

1.2. Stare events

A Stare event was identified by an extended "look" towards another individual usually lasting 1-2 sec (Ren et al., 1991), accompanied by the lifting of the eyebrows associated with or giving the impression of opening the eyes wider. The focal subject's head would protrude forward towards the assumed "Stare" recipient (Gruter, 2003, Ren et al., 1991).

The head protruded forward and the extended period over which the "look" occurred were the most specific features that distinguished a Stare event from a Glance event.

Potential areas of Error

Stare events had the potential areas of error as Glance events. The longer period of time over which a Stare event occurred and the usual accompanied shift in body position, though this not a requirement, decreased the likelihood of error.

Relationships to other Behavioural events

Stare events had the same relationship as Glance events to other Behavioural events.

2. Proximity event

A Proximity event was defined as a move to within the proximal bubble: a sphere defined by either subject's arm reach, and no other behavioural event associated, with certain exceptions. This definition of a Proximity event was used rather than an arbitrary measurement, for example, 2 or 5 metre radius or closest individual, for three reasons:

1. The “proximal bubble” means that Proximity event scores are **a direct function of the area that the subject could physically interact with other individuals.**
2. From further away, an arbitrary distance between objects appears less; this may result in an **unacceptable degree of subjectivity when scoring.**
3. A simple measure like the proximity bubble **improved precision and speed in scoring.**

Potential areas of Error

There were two potential areas of error when scoring Proximity events:

1. **The tail** was not considered when calculating the proximal bubble, a technique adopted from Swedell’s (2002) criteria for “sitting close” (Proximity). When the subject was in long grass or when there was a large clumping of subjects, the tail was difficult to see.

2. Proximity events were scored taking into **consideration any physical barriers,** a subject on one side of a wall and another on the other were not considered to be within the proximal bubble, although the presence of other subjects were not considered a physical barrier. The decision for third parties not to be a barrier was made because judgement on the ability to reach the other subject might not always be correct.

Relationship to other Behavioural events

Proximity events did not take precedence over any other Behavioural events. However, a number of Behavioural events took precedence over Proximity events (*see relevant sections*). Look events could occur simultaneously with Proximity events and were scored as separate Behavioural events without a new Proximity event being scored.

3. Body Contact events

Physical contact between subjects were classed as Body contact events. Five different types of Body contact events were distinguished: Greater and Lesser body contact, Embrace, Hold lumbar and Tail grab.

3.**1. Greater and Lesser body contact events**

> A Greater body contact event consisted of approximately greater than twenty percent of the initiator in contact with the recipient. A Lesser body contact event consisted of less than or equal to twenty percent of the initiator in contact with the recipient. Field data collected in the ZNNR also included a body contact of unknown amount to describe Behavioural events where a definitive classification of the amount of body contact between two individuals could not be made.

Twenty percent was selected as the cut off point because in the trial runs, twenty percent was found to be an **easily identifiable** amount and had a very **low likelihood of miss scoring.**

Potential areas of Error

There were four potential areas of error when scoring Body contact events:

1. A subject could **move between Greater and Lesser body contact events** with another subject. Since both were considered separate Behavioural events, this could lead to an inflation of scoring as a subject shifts body position between the two categories.
2. **Visibility**:
    a. Increased distance made discerning the amount of body contact difficult.
    b. Periods when large numbers of individuals would "clumped together in a huddle" made scoring correctly difficult.

3. **Very low levels of body contact**, possibly less than five percent body contact, may not have been documented, because of the limited field of view of the observer (distance, barriers etc).

Relationship to other Behavioural events

Greater and Lesser body contact events took precedence over Proximity events. Embrace, Groom, Wrestle events took precedence over body contact events. Look events could occur simultaneously with a Greater or Lesser body contact event, without a new Greater or Lesser body contact event being scored.

A Behavioural event that involved a subject leaving physical contact and remaining within Proximity was scored as a new event (Proximity event). Greater and Lesser body contact and Proximity events were considered separate Behavioural events.

If a change in Behavioural event by the subjects, for example, Hold lumbar or Groom, occurred followed by a return to a Greater or Lesser body contact event, the new Body contact event was scored as a new Behavioural event as well.

3.2. Embrace event

An Embrace event was said to occur when body contact between subjects exhibited the features described in the table 3.

Table 3: Description of an Embrace event

Feature	Description	Notes
Body contact.	Greater than twenty percent body contact with other subjects involved in the embrace.	Immatures involved in an embrace between two adults were assumed to be embraced by both subjects. An older juvenile or adult was considered too large to be within an Embrace event like an infant and so the third party was scored in terms of body contact.
Position of legs.	The legs of the subjects involved were curled up towards the body.	
Body Position.	The subjects were ventrally facing with the head inclined inward and down, within each other's fur (Davison, 1982).	Gruter (2003) also included dorso-ventral positioning. This was not included in this study, as it would lead to miss scoring with Hold lumbar.
Three (non-immatures) subjects embrace.	The individuals involved appeared to still be embraced even with the removal of any one individual (Picture 3 and 9).	
Obstacles.	Obstacles could alter the shape of an embrace slightly.	The Embrace event still conformed to the generalized criteria but a slight amount of flexibility due to the intervention of immovable objects, or other subjects, was acceptable.

Potential area of Error:

Many previous studies such as Ren et al. (1991), Davison (1982)* and Rowell (1966) have the requirement of arms around, even partially, the other subject when describing an Embrace event. In most cases, I observed this in Embrace event involving two subjects, but when a subject was simultaneously embracing an infant this was not always observed, so this was not included as a criterion. As this was the basis of the definition of an Embrace event in many studies, personal observations were used to identify a collection of associated features distinct to Embrace events involving arms around the other subject, which could be used to distinguish an Embrace event without the arms around. Davison (1982) also noted tails circling the embraced pair but for reasons similar to those described for Proximity events, this was not included. This broader definition may mean that this study classified a number of Behavioural events as Embrace events, including the three (non-infant) subjects' Embrace events (Picture 9), that previous studies may have scored as another Behavioural event. As this study is a comparison between individuals within the study, this variation will not alter the relationship representation of the data. The uniform classification and the focus being "within study" comparison also means modifications in other behaviours will not alter the relationship representation of the data (unless otherwise noted, such as for Proximity events).

** The term "embrace" was not used by Davison (1982), but the behaviour fits the definition closely.*

Relationship with other Behavioural events

Embrace events took precedence over Proximity, Greater and Lesser body contact events. Groom events took precedence over Embrace events, however, due to the small size of some of the immatures; an adult subject could embrace an immature and still perform other Behavioural events, which would be scored. Look events could occur simultaneously with an embrace event; the shifting of the head out of the "incline inwards and down" during the Look event was not used as a basis for scoring a new Embrace event.

3.**3. Hold lumbar event**

A Hold lumbar event was a body contact event that was identified by key features listed in the description by Ren et al. (1991) and Gruter (2003) and modified/confirmed in this study:

1. A subject encircles or **clasps another, using both hands, the lumbar**, hips, haunches, region of another while sitting ventrodorsally.
2. Accompanied by **head butting and apparent mouth grooming** or "Back licking", of the recipient by the initiator.

Potential areas of error:

Glance events towards the recipient of the Hold lumbar event were not scored because it was often difficult to identify the occurrence of the Glance event; the position of the head during a Hold lumbar event was predominantly facing toward the recipient.

Relationships with other Behavioural events

Wrestle and Groom took precedence over Hold lumbar events. Head butting, mouth grooming or "back licking" (by the initiator on the recipient) events that occurred concurrently with a Hold lumbar event were not scored as separate Behavioural events, they were considered part of the Hold lumbar event by the definition *used in this study*. Mouth grooming/back licking during a Hold lumbar event meant that if directly followed by a Groom event, the Groom event was considered a Reciprocal and not a Single groom event (*see Groom event section*). Body contact and Proximity events were considered components of the Hold lumbar event. Look events could occur simultaneously with a Hold lumbar event and were scored without a new Hold lumbar event being scored.

3.4. Tail grab event

A Tail grab event was identified by "grasping" by the hand of the tail of another subject; this included pulling or hanging from the subjects tail (Gruter, 2003). The tail was not considered part of the subject for Proximity events (*see Proximity events section for explanation of this omission*), therefore it was possible for a subject to "Tail grab" another subject without entering the proximity of the subject whose tail was being grabbed.

Relationship to other Behavioural events

Proximity and Body contact events were scored separately to a Tail grab event, though for scoring Proximity and Body contact events, a Tail grab was considered the initiation of a new event and thus after the event, Proximity and Body contact events were scored as new events. Wrestle events were never observed simultaneously with a Tail grab event, nor were "Rare" events. Look events could occur simultaneously without a new Tail grab event being scored.

4. Mount events

A Mount event was identified by the description for mounting given by Ren et al. (1995) and Clarke (1991) and confirmed in this study (table 4). Mounting could take two forms: Copulation: male on female mounting, or Pseudocopulation, female on male or same sex mounting (Clarke, 1991, Ren et al., 1995).

Table 4: Description of a Mount event

Feature	**Description**
Positioning	Mounting occurred from rear
Body contact	Subject 1 holds subject 2 around midsection, subject 1 possibly holds subject 2's leg with foot.
Head movement	Subject 1's head tilted
Glancing	Possible glances between participants.
Movement	Rhythmic swaying of the mounter's hips.
Duration	Mounting events would last less than one minute.
Vocalisations	Male vocalisation, described as "O…O". Vocalisations were not included in this Behavioural event; the observation distance limited the ability to identify vocalisations.

Relationship to other behaviours

Mount events took precedence over Proximity, Body contact and certain Glance events. These Behavioural events were considered side effects of the Mount event and were not scored as separately. Glance events between the mounter and the mountee were not scored as a separate Glance events. Look events directed towards other subjects were considered separate Behavioural events and could occur simultaneously without a new Mount event being scored. Slight pauses when a Look event occurred were not considered initiating new Mount events if the mounting position was sustained. If at the end of the Mount event, signified by the "dismounting", one of the three events listed above occurred, the Behavioural event was scored.

5. Groom events

Three Groom events types were scored: Grooming directed towards the focal subject's own body was classed as a Self groom event; Grooming directed towards another individual was either a Single groom event or a Reciprocal Groom event. Judge and Mullen's (2005) requirement for a minimum of 5 seconds was not included, although personal observation was that Groom events went for longer than this (*see appendix 2: Timed events in ZNNR*). Groom events were identified by the following features:

1. **Body/Fur Inspection:** Periods of looking at the area being groomed (Gruter, 2003, Digby, 1995).
2. **Fur and Skin manipulation** (Cooper and Bernstein, 2000): by either hand or mouth (Judge and Mullen, 2005). This could be identified by the parting (Bertrand, 1969, Digby, 1995), tugging or plucking of the fur (Bertrand, 1969), and the removal of object, such as dirt (Strier, 2003, Digby, 1995). The use of the mouth to groom (Gruter, 2003) or "oral manipulation" (Cooper and Bernstein, 2000) was considered the same Groom event as grooming by hand *because while functionally different, both gave the same result to the recipient.* Film 10. Mouth groom event shows a combination of hand and mouth grooming.
3. **Body slaps:** The slapping of the recipient body. A potential explanation is that slaps function to encourage hair erection or blood circulation (Chris Wood, pers. comm.). It was also suggested this may be an aberrant learned behaviour in SWAP resulting from captivity with no adaptive value (Chris Wood, pers.

comm.); the "slapping" was described as learned behaviour from mother to offspring (Qi Jun Hua, pers. comm.), the behaviour was also observed at ZNNR, though very infrequently.

4. **Lip** Smacking (Gruter, 2003); personal observations would suggest the presence of individual differences (similar to Bertrand (1969) for macaques).

Body slaps and Lip smacking was observed only in some of the Groom events, possibly due to an impaired visual contact.

Subjects might shift positions during a Groom event. A loss of body contact and/or a move out of proximity, followed by the continuation of grooming, was scored as a new Groom event. Shifts in positions that did not include loss of body contact and a move out of proximity were not scored as new Groom event.

3.1. **Reciprocal Groom event**

Reciprocal Groom events were scored as separate Groom events. Reciprocal Groom events were distinguished from Single groom events by occurring directly after a Single groom event without the intervention of a different behavioural event. A period of inactivity between grooming "bouts" by the same individual was scored as two separate Single groom events.

Potential area of Error

The focal subject may already be involved in a Groom event at the initiation of a data collection session. It was unknown whether these were the first Groom event: a Single groom event, or subsequent grooming event: a Reciprocal Groom event. In this study, they are scored were Single groom events.

Relationship to other Behavioural events

Proximity, Body contact and Glance events between the groomer and the groomee that occurred during the Groom events were not scored. These events were considered side effects of the Groom event. At the end of the Groom event, signified as an extended period without grooming, if any of the three events listed above were observed, the Behavioural event was scored.

Glance events of groomee to groomer were scored. The focal subject may direct a Look event towards subjects other than the recipient of the Groom event, and this behavioural event was scored. Slight pauses when a Look event occurred, as seen in the examples of Glance events are shown in Film 1: Groom event (at approx. 10, 16, 27 seconds), were not considered as initiating new Groom events.

6. Approach-retreat events.

An Approach-retreat event was identified when a subject moved towards another subject, and the second subject retreated while the first subject was still approaching. An Approach and Retreat event was scored only when the projected trajectory of the approacher entered the retreater's pre-retreat proximity bubble (*see proximity events for explanation*). If the approacher stopped within the proximity bubble and the other subject then initiated locomotion, this was not considered an Approach–retreat event but a Proximity event.

Two forms of the Approach-retreat event were scored. The first, Approach (walk)-retreat, occurred when the approaching subject moved at a walking pace. An Approach (run)-retreat event is a similar event except that the approaching subject is moving at a faster pace, a run. The retreating subject often moved at a faster pace as well, though the speed of the retreating subject was not used as a classifying factor.

Relationship with other Behavioural events

Chase events took precedence over Approach-retreat events. Glance events could occur simultaneously with an Approach-retreat event without scoring a new Approach-retreat event. Body contact, and events that involve body contact, were scored separately from Approach-retreat events. Approach-retreat events that occurred after these events were scored as new Behavioural events.

7. Chase events

A Chase event was an extended form of an Approach(run)-retreat, with the approaching subject continuing the pursuit of the retreating subject, described as a "rapid pursuit of an escaping individual" by Gruter (2003).

Potential areas of error

Follow events were not scored in this study because of the potential for mis-scoring with Chase events.

Relationship with other Behavioural events

Chase events took precedence over Proximity events if both subjects involved were in locomotion. Chase events took precedence over Approach-retreat events. Look events could occur simultaneously with a Chase event without a new Chase event being scored. Body contact, and Behavioural events that involved body contact, were scored separately to Chase events. Chase events that occurred after these were scored as new Behavioural events.

8. Lunge event

A Lunge event was a short forward body motion, often without moving the feet (Bertrand, 1969), and appearing as an "attempted grab" (Gruter, 2003). A Lunge event, in most cases, was followed by a retreat by the assumed recipient of the Lunge event. Digby (1995) description of a lunge noted stopping before body contact was made. Lunge events in *R. roxellana* occurred very quickly and whether or not body contact occurred could not always be identified, so this criterion was not included.

Relationship to other Behavioural events

Lunge events took precedence over Proximity and Body contact events. Proximity and Body contact events were considered incidental to the Lunge event and were not scored as separate events. Other Behavioural events scored in this study were not observed to occur during Lunge events, probably due to the short period over which the Lunge event takes place.

9. Wrestle events

A Wrestle event involved all or a subset of the following: Body contact, Fur pull, Arm pull, Slap, Face grab, Swipe and Lunge, without interruption. A Wrestle event was often accompanied with grimace facial expressions, but these were not always observed possibly due to of poor visibility.

Potential area of Error

Play wrestle events were not distinguished from Wrestle events, because there was no practical difference between the two categories. The presence of a play face was not a viable criteria as distance and the speed of the event made identification of these features impractical.

Relationship to other Behavioural events

Wrestle events took precedence over Proximity and Body contact events. At the end of the Wrestle event, signified by an extended period without wrestling, if one of these had been observed, they were scored. Slight pauses within a Wrestle event, if the subjects did not alter their positions, were not scored as new Wrestle events. Fur pull, Face grab, Arm pull, Swipe and Lunge events were not scored as separate Behavioural events when they occurred during a Wrestle event.

10. Steal food event

A Steal food event was identified when a subject forcibly took food from another's subject possession. Possession in this behavioural event was defined as clearly holding the food item. It was not required for the stealer to consume the stolen food item. A shared food event (not scored), both subjects feeding on the same food source, was differentiated from a Steal food event by the change of food ownership observed in a Steal food event.

Steal food events were not recorded in the ZNNR portion of this study. This may have been because it did not occur or because of observation conditions.

Relationship to other Behavioural events

Steal food and Proximity events can occur simultaneously without either being scored twice. Steal food events did not have to be associated with a Proximity event as a subject can enter proximity, take the food and then leave proximity without stopping, a requirement for the Proximity event to be scored (end event). Body contact during the Steal food event was considered incidental and was not scored as a separate Behavioural event. Behavioural events not discussed were not observed during Steal food events, probably due to the short period over which Steal food events took place.

11. Rare Behavioural events:

Rare Behavioural events included those that fit the criteria of the selected behaviours but were rare (at least for scored observations). Rare Behavioural events were:

1. **Pull:** A subject pulled another subject towards it.
2. **Head pull:** A subject pulled the head of another subject towards it.
3. **Fur grab:** A subject grabbed the fur of another subject and pulled towards it.
4. **Arm grab:** A subject grabbed the arm of another subject and pulled towards it.
5. **Slap/swipe:** A subject slapped/swiped another subject, usually in the facial region, and not associated with a grooming event.
6. **Face Grab:** A subject appeared to grab the nose area of the facial region of another subject, and directed the second subject's head to face it.
7. **Head butt:** A subject repeatedly butted another subject's body with its head (scored only once per bout).
8. **Push:** A subject pushed the body of another away from it.
9. **Head push:** A subject pushed the head region of another subject, usually in a downward manner.

Relationship to other Behavioural events

Rare Behavioural events could occur concurrently with Proximity and Body contact events without a new Behavioural event being scored. Wrestle events took precedence over rare Behavioural events; during a Wrestle event, Rare events were not scored as separate Behavioural events, nor did their occurrence signify the scoring of a new Wrestle event. Look events could occur in unison with Rare events. An individual facing another because of the Face grab event was not scored as committing a Glance event. Behavioural events not discussed were not observed to occur during rare Behavioural events, probably due to the short period over which these Behavioural events took place and their limited occurrence.

Relationships between Behavioural events (overall)

There are two major relationships between Behavioural events that were taken into consideration for this study:

1. **Precedence:** These involve Behavioural events that were considered the primary or "end" event and those considered coincidental or required for the "end" event to occur, these were not scored.
2. **Behavioural events that occurred in unison:** Behavioural events that could occur simultaneously and were both scored.

Swedell's (2002) methodology was based upon a similar decision, grooming and "sitting close" were considered mutually exclusive, "sitting close" was a prerequisite for a Groom event, and thus when an individual groomed another only the Groom event was scored. The result of this is that the two Behavioural events can be considered independent measures of social interactions, as suggested by Swedell (2002). Table 5 summarizes the relationships between all Behavioural events documented in this study.

Table 5: Relationship between Behavioural events

Behavioural event	Behavioural events that take precedent	Behavioural events taken precedent over	Behavioural events that can occur in unison
Glance	Stare		All Behavioural events except Stare
Proximity			Glance and Stare
Greater or Lesser Body contact	Embrace, Groom and Wrestle	Proximity to the subject that the body contact is with	Glance and Stare
Embrace		Proximity, Body contact and Glance when occurring between subjects involved in embrace	Proximity, Body contact, Glance unless towards the other subject involved in embrace and Stare
Hold lumbar	Wrestle and Groom	Head butt, Body contact, Proximity to the subject that the body contact is with	Glance and Stare
Tail grab			Proximity, Body contact and Glance
Mount		Proximity, Body contact and Glance when occurring towards mountee or mounter	Glance and Proximity, Body contact unless towards the mountee or mounter and Stare
Groom		Proximity, Body contact and Glance when occurring towards groomee or groomer	Proximity, Body contact, Glance unless towards the groomee and Stare

Behavioural event	**Behavioural events that take precedent**	**Behavioural events taken precedent over**	**Behavioural events that can occur in unison**
Approach-Retreat	Chase	Proximity of the other subject involved in the approach-retreat	Proximity unless towards the other subject involved in approach-retreat, Body contact, Lunge, Stare and Glance
Chase		Approach-Retreat, proximity of the other subject involved in the Chase event	Proximity unless towards the other subject involved in Chase, Body contact, Lunge, Stare and Glance
Lunge	Wrestle	Body contact and Proximity between subjects involved in Lunge event	Stare
Wrestle		Fur pull, Face grab, Arm pull, Swipe, Lunge, Proximity and Body contact	Stare
Steal food			Proximity, Body contact with other subject involved (if incidental), Glance and Stare
Wrestle		Fur pull, Face grab, Arm pull, Swipe, Lunge, Proximity and Body contact between subjects involved in the Wrestle event	Stare
Tail grab			Proximity, Body contact, Glance, Stare

Picture 1: Examples of Proximity events (SWAP and ZNNR).

Picture 2: Examples of Greater and Lesser body contact event (SWAP)

Picture 3: Examples of Embrace events (SWAP and ZNNR)

Picture 4: Examples of Hold lumbar event (ZNNR).

Picture 5: Examples of Copulation events (SWAP and ZNNR).

Picture 6: Examples of Groom event (ZNNR).

Picture 7: Example of Self groom event (ZNNR)

Picture 9: Example of Three-way Embrace event (SWAP).

Methodology Section 2: Data collection

Content
Summary
Preliminary Data trials
Overall data collection method
Modification for data collection in Shanghai Wild Animal Park
Modifications for data collection in Zhouzhi national nature reserve
Data analysis

Summary:

This section contains:

1. *Preliminary data trials,*
2. *Overall data collection method,*
3. *Modification for data collection in Shanghai Wild Animal Park,*
4. *Modifications for data collection in Zhouzhi National Nature Reserve,*
5. *Equipment used and*
6. *Data analysis.*

The method of data collection was developed based on experience by myself: the primary researcher, personal communication with Professor Colin Groves and Dr Craig Kirkpatrick, Professor Baoguo Li and descriptions and suggestions in previous studies.

1. Preliminary Data trials

A number of data collection methods and Behavioural event descriptions were tested on the Playground group of Shanghai Wild Animal Park (SWAP) between the 18th and 24th February 2004. Modifications to the study were performed and tested during this period. Verbal note taking on tape recorder was the selected primary form of data collection. This was found to be the most effective method and was therefore utilised throughout the study. Subjects in the ZNNR did not appear to be as active as those in the SWAP; this, combined with greater experience in identifying behaviours and, familiarity with the study parameters, allowed formalised field notes to be included (timed events predominantly), though the majority of the data was still collected using tape/digital recording.

Upon the completion of the preliminary data trials –the Behavioural event definitions were examined and modifications were tested to study the impact the changes would have on the validity of the data collected. The method of note taking was also examined by running the trial data through transcription and mock analysis to ensure the quality of the notes taken.

Audio tapes were used for the majority of the data collection; a digital recorder was introduced in the later months at the Zhouzhi National Nature Reserve (ZNNR) because of the increased ease of collecting data without the danger of running out of tapes.

2. **Overall data collection method**

Focal animal continuous recording* (Altmann, 1974) was used to identify the relationships of individuals within the social subunit. Any modification between the three sites was kept to a minimum.

For each Behavioural event the initiator, the recipient, or in the case where this could not be identified, unknown initiator, and any notes on the Behavioural event were taken.

Only initiations of Behavioural events listed previously were recorded. This information, when possible, was collected for timed events as well.

* *ad libitum sampling for timed events*

Habituation

A period of habituation was used in some of the study sites. For the Playground group this was combined with the period of preliminary data collection method/Behavioural events definition testing; for the Caged female group this consisted of a few hours; and the study subjects in ZNNR did not require a period of habituation.

Identified individuals' data collection method:

The first focal subject for each group was selected based on:

a. **Visibility**,
b. Ease of **identification**,
c. Lack of potentially **behavioural modifying factors**, such as being medicated, recently removed, introduced, artificially marked or suffering from a recent illness (based on personal communication with other researchers and park employees or personal observations of the monkeys or field diary notes).

After the first session, which would last as long as visual contact was possible, another individual was selected based on the same criteria, though now not including the first, and on the third day and so on until all individuals had been selected. After this, selection being based on of the number of focal hours (lowest).

Non-identified individuals (ZNNR):

The second component of this study focuses on individuals within the Western Ridge Troop (WRT). While attempts at identifying individuals were ongoing throughout the study period, when identification was not possible the data were collected at the level of age/sex classes.

Subjects were selected from the One male unit (OMU) that most closely fit the following criteria:

a. Were not being marked or hair sampled at the time of the study and if had been marked or hair sampled, the selection was the OMU with the longest period since this occurrence (Based on field notes and condition of markings),
b. Had representatives of each of the key age/sex classes (Subadult, adult female, adult male) and reproductive state (nursing and non nursing); whenever possible, at least two individuals of all age/sex classes except male (only one adult male was present in any OMU),
c. Were at distance from the riverbed and other researchers to ensure low contamination due to disruptions and
d. Were in an observable position because of the increased potential for loss of visual contact and misidentification of individuals not individually identified.

Once an OMU had been selected, an individual was selected from the age/sex class with the lowest amount of contact hours.

3. Modifications for data collection in Shanghai Wild Animal Park (SWAP):

After the subjects were released into the playground area, either the Playground or the Caged females troop was selected and time was given to allow the subjects to acclimatise and become accustomed to the presence of the researcher. This time was variable because of changes in the time they are released, the earlier presence of other workers or tourists to the park.

Observations/data recording were collected between 8:00am to 4:30pm, local time, when subjects were returned to indoors. The observer remained on the observation site for the duration of the session; breaks, pauses or deviations from this were considered a pause in the study and this time was not included in the analysis. If visual contact was lost with the focal animal for greater than 5 minutes, focal animal continuous sampling began with a new animal.

4. Modifications for data collection in Zhouzhi National Nature Reserve for the Golden Snub-Nosed Monkey (ZNNR):

The One male unit (OMU) designated as JB unit was selected as the primary focal identified unit because of its stability and the presence of at least two individuals of each age/sex class at the time of the selection (2 females, 2 females with immatures, 2 subadults, 1 male). When JB unit was not visible or identifiable, I selected one of the other OMUs. Selection was based on a similarity to the criteria for an ideal unit (above). Individuals were selected as focal subjects following the same procedure as used in the SWAP component of the study. Whenever possible, identified units were selected over non-identified units, and identified individuals over non-identified individuals.

Data Analysis:

1. Data were collected on audio tape/electronic media during the session times.

2. For each group, the Playground group, the Caged female group and each of the One male units of the ZNNR, the data were divided into two categories based on a key social event, as described in table 5.

Table 5: Key social events used as point of division in the data.

Group	Event	Explanation
Playground group	The removal of NSF	The removal of the subject resulted in the alteration of the number of potential social partners.
Caged females group	The inclusion of the male	The inclusion of a subject resulted in the alteration of the number of potential social partners.
ZNNR identified OMU	Birth season	Preliminary analysis of the data from SWAP suggested that the presence of offspring altered a subject's documented interactions. A number of non-nursing females became nursing females after the birth season (after the 4th month).

3. Audio tapes/Digital files were transcribed.

4. Transcribed data were compiled into Dyadic directional based interactions (where the initiator of the interaction was unknown, it was compiled as a dyadic unknown directional interaction).

5. Steps 2 and 3 were repeated to confirm the legitimacy of the data transfer.

6. Analysis was performed to identify the overall preferred Behavioural event partner, initiator and recipient.
   i. Behavioural events were classed as being representative of an **Affiliative or Agonistic relationship** based on literature reviews; Behavioural events that could not be classed as either Affiliative or Agonistic, based on literature review and personal observations and communication with other researchers, but were social in nature were classed as **Other events**.

ii. Three behavioural event categories consisting of combined results were constructed.
    1. **Overall groom events**: containing Single groom and Reciprocal groom events.
    2. **Overall Body contact events**: containing Greater body contact, Lesser body contact, Embrace and Hold lumbar
    3. **Displacement events**: containing Approach(walk)-retreat, Approach(run)-retreat and Chase events

iii. **Key Behavioural events** that fit the criteria of two or more partners and on average five or more events recorded per individual (to allow for Chi-square statistical analysis).

iv. The Behavioural event partner, initiator, and recipient that scored the highest number of each event were calculated and the **individual represented in the most number of each Agonistic and Affiliative events** (partner, initiator and recipient) were calculated.

v. For **Age/sex level analysis**, individuals were divided into Male, Female, Female carrying immatures (infants to young juvenile status), Subadults, Subadults carrying immatures.

7. Sociograms were used to present the social networks from each individual's point of view identifying the most prominent interaction partner for each Relationship type.

9. Chi-Square goodness of fit statistical analysis was performed using SPSS to identify whether each data set the observed rates of interaction varied ($p<0.001$) from non-preferential interactions (equal variances in each set). All data presented as percentages approximate the nearest whole number.

10. Dominance ranking was calculated by subtracting all Displacement events with each subject where the focal individual was the recipient from all displacement events where the focal individual was the initiator (Rowell, 1966). These were then ranked according to their numeric value.

,Methodology Section 3: Feeding regime

Content
Summary
Shanghai Wild Animal Park
Playground study site provisioning regime
Caged female study site provisioning regime
Differences between Captive study sites provisioning regimes
Captive subjects behaviour during provisioning
Captive subjects diet
Zhouzhi National Nature reserve
Provisioning site provisioning regime
West Ridge Troops' behaviour during provisioning
The provisioned diet
The species' natural diet

Summary

This section contains:

1. *The playground and Caged females group provisioning regime,*
2. *Differences between Captive study sites' provisioning regimes.*
3. *The Captive study subject behaviour during provisioning,*
4. *The Captive study site subject's diet,*
5. *The provisioning regime within Zhouzhi National Nature Reserve,*
6. *The Western Ridge Troop behaviour during provisioning,*
7. *The provisioning diet and*
8. *Previous studies compilation to gain a rough overview of the species' natural diet.*

Shanghai Wild Animal Park

The feeding regime of the two *Rhinopithecus roxellana* troops at the Shanghai Wild Animal Park (SWAP) was regulated. The keepers ensured that all subjects had access to at least some food items during feeding times, and the general good health and large size of the subjects along with the regular examinations by the keepers and veterinary staff of the park, would support the assumption that food items were being distributed to all subjects.

1. The Playground and Caged female troops provisioning regime

Keepers of the *R. roxellana* enclosure of the SWAP supplied the captive troops with an assortment of food items through each day. The provisioning regime and food items available differed slightly between the two groups, though most of the difference was the result of the dimensions of the cages and external influences outside the provisioning regime.

Playground study site provisioning regime: The keepers would scatter the food items within the playground study site quickly. On occasion, the keepers would retain some food items to administer later during the feeding session to monkeys without access to enough food items, or to encourage closer proximity of the subjects to the keepers for visual observation. The keepers rarely interacted with the monkeys, except to stop food monopolisation by actions such as individual feeding and reprimanding actions, particularly towards the males, and visual examination. At the end of each day, when the subjects were removed from the Playground study site, some food items remained in the area, usually tree branches (the least preferred food item in all groups); this further confirms that all subjects were given access to food items.

On 27th of April 2004, a keeper was seen to stand between S, NS and ST (all males) and the rest of the group during feeding sessions and this continued to happen irregularly during subsequent feeding sessions. The keeper's presence between the two portions of the group may have decreased the number of interactions during feeding times.

Caged females group study site provisioning regime: Food items were distributed within Cage B upon the ground. The keeper would open the cage door and quickly throw the food items onto the floor of the cage. Tree branches were distributed in a similar manner though the keeper was observed at times to enter the cage and distribute the branches more widely, including into Cage A. Peanuts could be thrown through the wire but generally were delivered through the Cage B gate.

The keeper would remain outside the Caged females' caged area near the observation point within the night room observing the monkeys feeding for a period of time after provisioning, before leaving.

2. Differences between Captive study sites' provisioning regimes.

The Playground group was accustomed to the keepers' presence, and the keeper could remain within the enclosure, potentially without altering the behaviour of the subjects (*but see above for intentional alterations*). The Caged female troop's apparent greater sensitivity to humans within the cages meant that remaining within the enclosure was not possible without extreme behavioural alterations. The keeper's entrance to the cages coincided with monkeys either leaving the cages and entering the outside enclosure or moving to the furthest points from where he entered. The presence of the keeper within the night room did not appear to disturb the subjects, based on comparison to behaviour during keeper's entry of the Caged females enclosure. The Playground group's food was dispersed over a larger area than would be possible within the Caged females' area.

3. The captive subjects behaviour during feeding.

The subjects, to some degree, were forced near one other when feeding, because of the relatively low dispersal of food items. All food types, however, could be transported: branches could be dragged, titbits carried and, when feeding on grass, the subjects could take a handful or mouthful and feed elsewhere.

The Caged females troop would not descend and feed on branches in Cage B during sessions with the male, if the male was feeding on the ground. On these two occasions during the observation period, the keeper would re-enter the cage and place branches upon the hanging tyre within Cage A. Only when the male had left the area of food would the other subjects descend and feed.

4. Captive study sites subjects' diet

Details of the diet provided to the subjects were obtained from personal communication with Qi Jun-Hua and Xie Chun-Yu. Feeding times and distribution methods are approximations based on personal observations during the study sessions. The feeding times of both the Playground group and the Caged females group were staggered throughout the day. Feeding of Caged males, which could be observed by the Caged females group, followed/preceded feeding times of the Caged females. Table 1 summarises these details.

Table 1. Details of feeding regime (SWAP).

Food type@	Description	Distribution^ method	Feeding times ^	
			Playground Group#	Caged Females#
Fruit and vegetables *Varied seasonally and with supply.*	Sweet melons, apples, cucumbers, tomatoes, egg plant, banana, peaches, watermelons, Chinese dates.	Cut into pieces and thrown out over a wide area.	9:59am-10:38am 3:41pm-4:08pm	10:00am-10:35am 3:33pm-3:54pm (on 6 occasions: 1:11pm-1:28pm extra watermelon- usual during hotter days)
Nuts.	Peanuts.	Thrown out over a wide area.	12:53pm-1:31pm	12:51pm-1:30pm
Corn bread.	A semi-hard mixture consisting of corn, wheat, milk, eggs, salt, minerals and dietary fibre.	Cut into pieces and thrown out over a wide area.	9:39am-10:35am 3:12pm-3:54pm	9:56am-10:42am 3:11pm-4:06pm

Food type@	Description	Distribution^ method	Feeding times ^	
Tree branches *Varied seasonally and with supply.*	Branches**	Left in number of piles within enclosures.	8:00am-9:19am 12:01pm-1:46pm 2:11pm-2:41pm	9:56am-9:57am 10:26am(12:30pm)-(11:00am)1:48pm## 3:57pm-4:23pm
Grass and weeds.	Present within enclosures.	Not applicable.	Throughout the sessions but not available during time when access to outside is removed.	Throughout the sessions but not available during time when access to outside is removed.
Dough Bread.	A soft mixture made from flour and water.	Cut into pieces and thrown out over a wide area.	9:39am-10:35am 3:12pm-3:54pm	9:56am-10:42am 3:11pm-4:06pm
Tourist food.	Varied-predominantly snack foods-rare.	Thrown from outside enclosure- very rare event.	Throughout the sessions but not available during time when access to outside is removed.	Not available ***

Earliest and latest feeding session recorded. Some variations in the feeding regime occurred, however, extreme variations of feeding due to disruptions were not included in the above table.*

***Tree branches were also placed in the night room near the end of observation periods (before the letting in of the Playground group)*

****The distance from the Caged females open area and the tourists' walkways made it unlikely that any food were thrown to them. Tourists had no access to the Caged males (See Captive component study site)*

##-Brackets are a separate times used upon occasion.

^ pers. obs

Zhouzhi National Nature Reserve for the Golden Snub-Nosed Monkey (ZNNR)

The diet of the *Rhinopithecus roxellana* group used for this study at the Zhouzhi National Nature Reserve for the Golden Snub-Nosed Monkey (ZNNR) was a combination of naturally occurring food items and provisioning at the provisioning site within the Gongnigou valley. Provisioning at the site performed three functions: firstly to encourage the group to enter and remain within the area; secondly, to avoid depletion of the natural foods in the valley as a result of the area artificially extended exposure to the monkeys foraging; and thirdly, to allow closer examination of the subjects by researchers. The group was herded to the area each day of study by local farmers who would locate the troop and encourage, via loud noises, their progression to the valley. Departure from the area during research sessions by the group was discouraged, by the presence of assistants at key points, but not prevented completely. I rarely observed the monkeys attempt to leave the area during the sessions that I was present. This would support the assumption that the monkeys were gaining enough food during their time within the valley.

5. The provisioning regime within ZNNR

Provisioning occurred in the riverbed area of the Gongnigou Valley. The river rarely had more than a very low water level and a number of social units could occupy the area feeding. Provisioning was performed by one or two of the researchers standing in the riverbed area and distributing the food items in an exaggerated fashion, standing in the clear visual sight, throwing the items in the air and swinging the arms widely out from the body. The provisioning was accompanied by loud “lalala” calls to gain the attention of the subjects and to highlight the presence of the provisions.

6. The Western Ridge troop behaviour during provisioning

The monkeys generally descended from the valley sides into the riverbed area soon after provisioning. Approximately two to three social units would be present within the riverbed area after provisioning was completed. Departure and replacement of the OMUs would occur for a period there after. On occasions, OMUs would enter the riverbed area prior to the provisioning and remain in the general area until provisions were distributed. The density of monkeys in the riverbed was greater than the surrounding area, caused mainly by an increase in the proximity between OMUs, but also to a lesser degree within OMUs. This may have led to an increase in the occurrence of Behavioural events.

The monkeys were, to some degree forced near one other when feeding, but all foods types could be carried, and eaten elsewhere.

The level of habituation seen in the Captive groups was not present within the Provisioned troop, though higher than in a pure wild troop. The majority of the subjects did not tolerate a close physical presence, approximately less than arm reach, of the researchers.

7. The provisioned diet

Details of the diet provided to the subjects were obtained from personal communication by the members of The Northwest University Golden Snub-Nosed Monkey Research Centre (GSNM) and personal observations. Feeding times and distribution methods are approximations based on personal observations during the study sessions. The feeding times were staggered throughout the day. Table 2 summarises these details.

Table 2. Details of feeding regime (ZNNR).

Food type	**Description**	**Distribution method**	**Feeding times**
Dried corn, turnips, apples *varied seasonally and with supply*	Turnips and apples were cut up into quarters.	Cut into pieces and thrown out over a wide area within the riverbed area (*see study site description*)	10:00am, 12:00pm, 2:00pm

8. The species' natural diet.

The provisions supplemented the natural diet present within the area. The natural diet listed in Table 3 was compiled from literature sources describing the diet of this species, in particular Li's (2001) and Su et al.'s (1998) study in the Shennongjia Nature Reserve, Kirkpatrick et al.'s (1999) study from the Baihe Nature Reserve and Kirkpatrick's (1995) review of Snub-Nosed monkeys. Overall, reports suggest that the diet shows strong seasonal variations, with bark and lichen becoming more prominent during the winter months; non-vegetable matter such as insects may also be included, possibly as a necessary source of protein. Occasional descents to the ground to consume herbs and insects was also reported (Li, 2001). In the Shennongjia nature reserve, *R. roxellana* diet consisted of leaves, stems, tender twigs, fruits, seeds, bark and lichen (Su et al., 1998). This study (Su et al., 1998) found that the animals never appeared to drink, but did eat snow, though they were observed in this study both in captivity and in the provisioned area to consume water either from the riverbed (ZNNR) or from provided water containers (SWAP). Snow consumption as such was not observed but may have also occurred.

Table 3: Natural seasonal diet* of *Rhinopithecus roxellana*#

Study	Month	Diet
Li (2001) Shennongjia National Nature Reserve.	Spring (March-May)	Buds, leaves, lichen, bark, insects, flowers
	Summer (June-August)	Leaves, fruit, bark, lichen, insects
	Autumn (September-November)	Lichen, bark, fruit, leaves, insects
	Winter (December-January)	Bark, lichen, fruit, insects
Kirkpatrick (1995) review.	Summer (June-August)	Leaves, buds, fruit, bark, grasses, fobs
	Winter (December-January)	Bark, lichen
Kirkpatrick et al. (1999) Baihe National Nature Reserve.	Summer (June-August)	Leaves, lichen.
	Autumn (September-November)	Lichen, buds, bark
Li et al. (2002) Shennongjia National Nature Reserve.	Winter (December-January)	Bark, fruit, insects, seeds

**Not including reports or items that did not show seasonal or monthly breakdown*

 # This table gives only a brief summary of the results found in the study see cited references for more in-depth description, study sites and species names in particular see Li et al. (2002) for an in-depth report of the species used during the winter season in the Shennongjia nature reserve.

Methodology Section 4: Study groups

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Summary

This Chapter contains:

1. *The classification scheme of subjects used in this study to define the age/sex classes as established based on previous work and this study,*
2. *The subject identification in terms of morphological features at the SWAP as an example of features utilised in this study, and*
3. *The age, sex, reproductive history, introduction to group and, where applicable, death of identified subjects.*

Age/sex classes.

1. The classification scheme of subjects

The age/sex categories used in this study were derived from those used by the North West University Golden Snub-nosed Monkey Research Centre (GSNM), the morphological differences identified in previous studies (Liang et al., 2000; Ren et al., 1998, 2001; Davison, 1982), and by personal communication with researchers. Because of the small number of subjects present in the SWAP study groups, actual birth dates, or approximations, were known. Post-hoc comparisons with classifications used in ZNNR were performed using photographs and visual description to confirm classifications.

Table 1 shows the approximate classifications of a subject from birth to adult. Some variation was encountered; during borderline periods between classifications there was a greater likelihood of misclassification. The use of morphological features was preferred, rather than age, to define the category because of the number of subjects that were not individually identified or whose birth date was not known. Examples of immatures are shown in Picture 5.

Table 1: Standardized Life cycle of a subject (from all sources: see below but with particular relevance to ZNNR (pers. obs))

Age (yrs)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
0-1				B/N	NI	ONI	ONI/ I	I	I/ OI	I /OI	OI	OI
0-1	OI	OI	OI	YJ	YJ	YJ	YJ	YJ	YJ	YJ	J	J
1-2	J	J	J	J	J	J	J	J	J	J	J-OJ	J-OJ
2-3	J-OJ	J-OJ	J-OJ	OJ	OJ	OJ	OJ	OJ	OJ	OJ	SAF/ OJM	SAF/ OJM
3-4	SAF/ OJM	SAF/ OJM	SAF/ OJM	SAF/ OJM	SA	SA	SA	SA	SA	SA	AF/ SAM	AF/ SAM
4-5	AF/ SAM	AF/ SAM	AF/ SAM	A	A	A	A	A	A	A	A	A

Key:

B: Birth, **N:** Neonate, **I:** Infant, **NI:** Natal infant, **ONI:** Older natal infant, **OI:** Older infant, **YJ:** Young juvenile, **J:** Juvenile, **OJ:** Older juvenile, **SAF:** Subadult female, **OJ male:** Older juvenile male, **SA:** Subadult. **AF:** Adult female, **SAM:** Subadult male, **A:** Adult

Adults

Dimorphism is marked (Davison, 1982, Kirkpatrick, 1995), particularly in general body size, weight, and size and shape of canines between adult males and females.

Adult males

Davison (1982) suggested that males could be considered adult at approximately 4 years (Picture 1), though Ren R. (2008, pers comm/Review) argues that the onset of maturity is more like 8 yrs. The GSNM classed a male as adult at approximately 5 to 6 years (Qi Xiao-Guang/Liu Jiu-Quan pers. comm.). The morphological features used to identify adult males are described in Table 2.

Table 2. Morphological features of adult males*

Feature	**Description**
Body size and weight	Largest body size and weight of all age/sex classes (Ren et al., 1998, 2001)
Hair	Long golden hair on the back, shoulders extending to the elbows and waist (Liang et al., 2000, Ren et al., 2001)**
Teeth	Large canine teeth, reaching 2.5 centimetres in length (Liang et al., 2000) ***
Lip warts	A wart on each corner of the upper lip (Liang et al., 2000, Ren et al., 2001, Davidson, 1982)****
Facial skin	Facial skin where bare is blue with greenish tinge# (Davison, 1982)
Tail	Tail slender in middle (Qi Xiao-Guang/Liu Jiu-Quan, pers. comm.)
Gentialia	Similar in colour and shape to the facial pattern: penis black, scrotum bluish white (Davison, 1982). The perineum has a bright blue line (Davison, 1982)*****

* Liang et al. (2000) described the features reported in their paper as “secondary sexual characters”.

** Liang et al. (2000) reported that the back hair starts growing at 5.6 to 6.3 years of age, in their study reaching 55 centimetres, and the growing period ends at 7.5 years of age. It was possible the hair on the shoulders and waist followed a similar pattern though this was not explicitly stated.

*** Canine teeth were reported emerging at 4.9 to 5.4 years of age and growing till 6 to 6.5 years of age (Liang et al., 2000).

****Liang et al. (2000) reported warts coming apparent at 5.4 to 6.1 years old, growth ending at 6.3 to 7 years of age. Davison (1982) reported the appearance of granulomatous flanges at 4 years of age (maturity). Ren et al. (2001) described the presence of tumescent warts.

Tinge not highly conspicuous, and not used as an identifying feature.

*****The bright blue line was not identifiable in this study.

Adult females

Davison (1982) suggested that females become adult at approximately 3 to 4 years of age (Picture 2); the GSNM, at approximately 3 to 4.5 years of age, which could often be confirmed by the presence of engorged breasts and prominent nipples (Qi Xiao-Guang/Liu Jiu-Quan pers. comm.). The morphological features used to identify adult females are described in Table 3.

Table 3. Morphological features of adult females

Feature	Description
Body size and weight	Smaller than adult males (Ren et al., 1998, 2001)
Hair	Back hair is short and light grey in colour (Ren et al., 2001)
Teeth	Canines not prominent
Lip warts	Lip warts small or absent (Qi Xiao-Guang/Liu Jiu-Quan, pers. comm.)
Facial Skin	Bare facial skin blue (Davison, 1982)*
Tail	No slender middle section, and shorter than males (Qi Xiao-Guang/Liu Jiu-Quan, pers. comm.)
Gentialia	External gentialia not prominent

* Appeared lighter blue with slight grey tinge in some females compared to males.

Subadult.

Subjects who have outgrown the juvenile classification but do not exhibit clear adult characteristics were classed as subadults. Subadults may have exhibited some poorly developed and incipient adult characteristics, such as coloration or size.

Subadult males

Males become subadult at approximately 3.5 to 5 years of age (Qi Xiao-Guang/Liu Jiu-Quan, pers. comm.), though the age range is considered by Ren R. (2008. pers comm/Review) to be between 6-8 yrs. The morphological features used to identify Subadult males are described in Table 4. Picture 3 shows NS of the AMU of Playground group, SWAP. NS was a very old Subadult.

Table 4. Morphological features of Subadult males

Feature	**Description**
Body size and weight	Smaller than Adult males (Ren et al., 2001, Qi Xiao-Gung/Liu Jiu-Quan pers. comm.). Ren et al. (1998) claimed that subadult males had the same body length as adult males, but were slimmer and had a lower body weight
Hair#	Golden hair not present (Ren et al., 2001) or shorter and more sparse and not extending over shoulders (Ren et al. 1998)
Teeth	No prominent canines
Lip warts#	Much smaller or not present (Ren et al., 2001)
Head and face	Reddish hair on face and head (Ren et al., 2001)*. The dark hair area on the scalp may be present but difficult to see (Liu Jiu-Quan pers. comm.)
Tail	No discernable features

*Similar to adult males (Ren et al., 2001).

Subadult females

Females become subadult at approximately 3 to 4 years of age (Picture 4). Older subadult females have been observed with offspring and could therefore be considered young adult even though secondary sexual features were not prominent. This can cause some disagreement in classification, as some researchers define the start of adulthood by the presence of the first offspring, while others feel that morphological features should be the main defining tool (Qi Xiao-Guang/Liu Jiu-Quan, pers. comm.). For this study, the morphological features were used, as alloparenting, a trait observed in many colobine species (Newton and Dunbar, 1994), could lead to misclassification. The morphological features used to identify subadult females are described in Table 5.

Table 5. Features of subadult females

Feature	Description
Body size and weight	Similar in body size to Adult females (Ren et al., 2001), but more slender
Hair#	The dark hair area on the scalp may be visible but less developed or absent (Liu Jiu-Quan pers. comm.). Back hair is darker and coarser than juvenile
Teeth	Canines not prominent
Lip warts	No lip warts
Nipples	Not obvious (Ren et al., 2001)

2. Subject identification

Subject identification was based on morphological features and examples of these identifying features are described in Table 6. The Table here is given as example of the morphological features that were used, both in the SWAP and the ZNNR. A system of paint marking of individuals in the provisioned troop in ZNNR, performed by the GSNM in the latter months of this study, was also utilised. Age/Sex classification and whether or not the subject was nursing could be verified by comparison with the records kept by the SWAP staff and GSNM.

Table 6. Personal identification key for adult subjects

Group	Name (tag)	Identification based on :
Playground group	One male unit male **(OMU male)**	Larger size compared the other males in the group. His hair was also darker than other males in the group.
	Stumped tail male **(ST)**	Shorter tail compared to others. The “crease” down the middle of his chest was also more pronounced than on other males.
	Shaggy male **(S)**	Longer back hair compared to other males in the group.
	Non shaggy male **(NS)**	Lack of shaggy back hair compared to other males in the group.
	Big breasted, big gut female **(BBBG)**	Large breasts and large stomach compared to other females in the group.
	Non shaggy female **(NSF)**	Long back hair and large size relative to other females in the group.
	Big breasted, small gut Female **(BBSG)**	Large breasts compared to other females in the group and distinguished from BBBG by the lack of a large stomach.
	Shaggy female **(SF)**	Small size and presence of long back hair compared to other females in the group.
Caged Females group	Male	Large size. The only male present in caged female group.
	Big breasted, big girl female **(BBBG2)***	Large breasts and overall size compared to other females in the group. Darker hair colouration than SHM.
	Shaggy haired, Mohawk female **(SHM)***	Long back hair and the dark hair area on the scalp was more developed compared to other females in the group.

Group	Name (tag)	Identification based on :
Caged Female group	Orange, big nipples female **(OBN)**	Strong orange colouration of coat and presence of extended nipples.
	White chest female **(WC)***	Lighter coloured chest (strikingly white) than other females in the group.
	Orange girl female **(OG)**	Strong orange colouration of her coat and smaller size compared to other females in the group.

** These 3 females were of very different colouration.*

3. The age, sex, reproductive history, introduction to group and death of identified subjects.

Records of key individuals in the SWAP and ZNNR have been kept by their appropriate agencies. Personal observations, personal communications and the Golden Snub-nosed Monkey stud book were used to document the details of individuals of SWAP and ZNNR.

Shanghai Wild Animal Park

The captive component of this study focused on the behaviour of subjects in two semi free-ranging groups. The captive study consisted of 24 subjects, of which 13 subjects were classified as adults/subadults. Details on age and genealogy, and when appropriate the date and location of their capture and the release date to the respective group were derived from *The 2003 International Studbook for Golden monkey, Rhinopithecus roxellana* (Yu, 2003), and by personal communication with Qi Jun-Hua and Xie Chun-Yu (employees of the park). Unless noted, information was based on the Stud book. These are described in Table 7.

Table. 7. Subject data for Shanghai Wild Animal Park.

Name (tag)	Code	Approximate age at the start of the study	Size ranking within troop	Release date into troop	Capture location	Capture Date	Birth Date (or estimate)	Sire	Potential Subspecies	Dam
Playground group.										
One Male Unit Male (OMU)	SY5#	13 (+/- 3) yrs	1	1996	Shaanxi	1994	1991 (+/-3yrs)	Unknown	*Rhinopithecus r. qinlingensis*	Unknown
Stumped Tailed Male (ST)	ANAN	12 (+/- 2 yrs)	2; the size difference between ST and OMU was greater (by a small margin) than between ST and S.	1996	Shaanxi	1994	1992 (+/-2 yrs)	Unknown	*Rhinopithecus r. qinlingensis*	Unknown

Name (tag)	Code	Approximate age at the start of the study	Size ranking within troop	Release date into troop	Capture location	Capture Date	Birth Date (or estimate)	Sire	*Potential Subspecies*	Dam
Shaggy Male (S)	SY97-1	6 yrs	3	Born in group	N/A	N/A	4 May 1997	Shanwang (140) wild born (Gansu)	*Rhinopithecus r. roxellana*	BBBG (SY1#)
Non Shaggy Male (NS)	SY98-1	4 yrs	4: smaller than S but unusually large subadult	Born in group	N/A	N/A	28 March 1998	120 wild born Gansu	*Rhinopithecus r. roxellana*	NSF (SY2#)

Name (tag)	**Code**	**Approximate age at the start of the study**	**Size ranking within troop**	**Release date into troop**	**Capture location**	**Capture Date**	**Birth Date (or estimate)**	**Sire**	**Potential Subspecies**	**Dam**
Big Breasted Big Gut Female (BBBG)	SY1#	13 (+/- 3) yrs	5	1996	Gansu	1994	1991 (+/-3yrs)	Unknown	*Rhinopithecus r. roxellana*	Unknown
Non Shaggy Female (NSF)	SY2#	13 (+/- 3) yrs	6	1996	Gansu	1994	1991 (+/- 3yr)	Unknown	*Rhinopithecus r. roxellana*	Unknown
Big Breasted Small Gut Female (BBSG)	SY3#	13 (+/- 3) yrs	7	1996	Gansu	1994	1991 (+/-3yrs)	Unknown	*Rhinopithecus r. roxellana*	Unknown

Name (tag)	**Code**	**Approximate age at the start of the study**	**Size ranking within troop**	**Release date into troop**	**Capture location**	**Capture Date**	**Birth Date (or estimate)**	**Sire**	***Potential Subspecies***	**Dam**
Shaggy Female (SF)	SY98-2	5 yrs	8: slightly larger than the largest juvenile.	Born in group	N/A	N/A	1 June 1998	SY7# (Male with caged females)	*Rhinopithecus r. roxellana*	BBSG (SY3#)
Juvenile#	SY01-2	2 yrs	9	Born in group	N/A	N/A	28 March 2001	OMU (SY5#)	*R. r. qinlingensis* x *R. r. roxellana*	BBSG (SY3#)

Name (tag)	**Code**	**Approximate age at the start of the study**	**Size ranking within troop**	**Release date into troop**	**Capture location**	**Capture Date**	**Birth Date (or estimate)**	**Sire**	***Potential Subspecies***	**Dam**
Juvenile #	SY01-4	2 yrs	9	Born in group	N/A	N/A	3 May 2001	OMU (SY5#)	*R. r. qinlingensis* x *R. r. roxellana*	NSF (SY2#)
Infant	03-1	1 yr	10	Born in group	N/A	N/A	26 April 2002	OMU (SY5#)	*R. r. qinlingensis* x *R. r. roxellana*	BBSG (SY3#)

Name (tag)	**Code**	**Approximate age at the start of the study**	**Size ranking within troop**	**Release date into troop**	**Capture location**	**Capture Date**	**Birth Date (or estimate)**	**Sire**	***Potential Subspecies***	**Dam**
Infant	03-2	<1 yr	10	Born in group	N/A	N/A	10 April 2003	OMU (SY#5)	*R. r. qinlingensis* x *R. r. roxellana*	SF (SY98-2)
Infant	03-3	<1 yr	10	Born in group	N/A	N/A	12 April 2003	OMU (SY#5)	*R. r. qinlingensis* x *R. r. roxellana*	NSF (SY2#) (Qi Jun Hua pers. comm.)

Name (tag)	**Code**	**Approximate age at the start of the study**	**Size ranking within troop**	**Release date into troop**	**Capture location**	**Capture Date**	**Birth Date (or estimate)**	**Sire**	***Potential Subspecies***	**Dam**
Caged Female group										
Male With Caged Females (MCF)	SY7#	13 (+/- 3) yrs	1	2004	Gansu	1994	1991 (+/-3yrs)	Unknown	*R. r. roxellana*	Unknown

Name (tag)	**Code**	**Approximate age at the start of the study**	**Size ranking within troop**	**Release date into troop**	**Capture location**	**Capture Date**	**Birth Date (or estimate)**	**Sire**	***Potential Subspecies***	**Dam**
Big Breasted Big Girl (BBBG 2) **	QING QING	13 (+/-3) yrs	2: slightly heavier and bulkier with a larger stomach than SHM	1998	Shaanxi	1994	1991 (+/-3yrs)	Unknown	*Rhinopithecus r. qinlingensis*	Unknown

Name (tag)	**Code**	**Approximate age at the start of the study**	**Size ranking within troop**	**Release date into troop**	**Capture location**	**Capture Date**	**Birth Date (or estimate)**	**Sire**	**Potential Subspecies**	**Dam**
Shaggy hair no Mohawk Female (SHM) **	TINGTING	13 (+/- 3) yrs	3: similar in size to BBBG2, but not so bulky	1998.	Shaanxi	1994	1991 (+/-3yrs)	Unknown	*Rhinopithecus r. qinlingensis*	Unknown
Orange Big Nipples Female (OBN) **	SY97-2	6 yrs	4: slightly less bulky than BBBG	1998	N/A	N/A	31 May 1997	124 Wild born Shaanxi	*Rhinopithecus r. qinlingensis*	WC (XIUXIU)

Name (tag)	**Code**	**Approximate age at the start of the study**	**Size ranking within troop**	**Release date into troop**	**Capture location**	**Capture Date**	**Birth Date (or estimate)**	**Sire**	**Potential Subspecies**	**Dam**
White Chest Female (WC)	XIUXIU.	13 (+/-3) yrs	5. Only slightly smaller than OBN and SHM.	1998	Shaanxi	1995	1991 (+/-3yrs)	Unknown	*Rhinopithecus r. qinlingensis*	Unknown
Orange Girl Female (OG)	SY98-4	5 yrs	6: slightly larger than a Juvenile but coloration differs	1998	N/A	N/A	19 March 1998	124 Wild born Shaanxi	*Rhinopithecus r. qinlingensis*	BBBG2 (QINGQING)

Name (tag)	Code	Approximate age at the start of the study	Size ranking within troop	Release date into troop	Capture location	Capture Date	Birth Date (or estimate)	Sire	Potential Subspecies	Dam
Juvenile	SY01 -6	2 yrs	7	Born in group	N/A	N/A	2 April 2001	YANYAN wild born Shaanxi	*Rhinopithecus r. qinlingensis*	BBBG2 (QINGQING)
Juvenile	02-2	1 yr	7	Born in group	N/A	N/A	26 April 2002	YANYAN wild born Shaanxi	*Rhinopithecus r. qinlingensis*	OBN (SY97-2)
Juvenile	02-1	1 yr	7	Born in group	N/A	N/A	23 April 2002	YANYAN wild born Shaanxi	*Rhinopithecus r. qinlingensis*	BBBG2 (QINGQING)
Infant	Infant 1	<1 yr	8	Born in group	N/A	N/A	14 April 2004	YANYAN wild born Shaanxi	*Rhinopithecus r. qinlingensis*	BBBG2 (QINGQING)
Infant	Infant 2	<1 yr	8	Born in Group	N/A	N/A	10 March 2004	YANYAN wild born Shaanxi	*Rhinopithecus r. qinlingensis*	SHM (TINGTING)

Name (tag)	Comments
Playground group	
One Male Unit Male (OMU)	Transferred to park: Oct 1995
Stumped Tailed Male (ST)	Transferred to park: Oct 1995
Shaggy Male (S)	09/04/04 Shaggy male removed from group due to irregular heart beat and general lethargic behaviour, but later returned to the troop.
Big Breasted Big Gut Female (BBBG)	Transferred to park: Oct 1995
Non Shaggy Female (NSF)	Transferred to park: Oct 1995 4/4/04-removed at the end of the session for observation but returned; present by the start of session the next day. 6/4/04, 12:37pm -- removed from troop (diagnosed as pregnant) and died. Cause of death unknown
Big Breasted Small Gut Female (BBSG)	Transferred to park: Oct 1995
Infant. (03-01)	Borderline juvenile, but morphology closer to infant
Infant. (03-03)	Stud book has dam listed as BBBG (SY#1)
Caged Female group	
Male With Caged Females (MCF)	Period of release: Variable Removed each afternoon at the end of the observation session

Name (tag)	Comments
Big Breasted Big Girl (BBBG2) **	Transferred to park: 1 Oct 1995 (approx.)
Shaggy hair no Mohawk Female (SHM) **	Transferred to park: Oct 1995
Orange Big Nipples Female (OBN) **	The birth of OBN and OG were the catalyst for the creation of the Caged Female group. Of all the group, OBN appeared the least agitated by the entrance of the keeper into the Caged females cages.
White Chest Female (WC)	Transferred to park: Oct 1995
Orange Girl Female (OG)	
Juvenile (SY01-06)	One juvenile appeared morphologically closer to the adults than the other juveniles
Infant	Data on infants in this group from personal communication with Qi Jun Hua
Infant	

**During the observation sessions with the Caged females group, Shaggy male (S) was removed from the playground group on a number of occasions; this was to allow recuperation from a wound on his face*

***The difference between the three subjects is minor and based predominantly on bulk.*

Explanation of categories in table 7:

Group. Name taken from respective enclosure (*see study areas section for enclosure descriptions*).

Name. The name given to the subject in this study by many, usually referring to prominent morphological characteristics Juveniles and infants were not individually identified because they lacked visible morphological differences.

Code. From *The 2003 International Studbook for Golden monkey Rhinopithecus roxellana* (Yu, 2003).

Birth date: The +/- gives the approximate range of potential error in the date of birth in captive subjects (Yu, 2003). The method of calculation of dates of birth is Unknown

Sire and Dam: The parentage of the subject, where known, was recorded based on information supplied by Qi Jun-Hua, Xie Chun-Yu and Yu (2003).

Size ranking. Based on personal observations of size and bulk. 1 is largest in group, 8 is smallest. Juveniles and infants, both groups, were given the same ranking; no juvenile or infant was greater in size than any adult.

Potential subspecies: Based primarily on the distribution as described by Wang et al. (1998). Some members of the Caged females troop, predominantly *Rhinopithecus r. qinlingensis*, did possess a strikingly more “golden” (or orange) pelage than the Playground troop, predominantly *Rhinopithecus r. roxellana,* a stronger coloured pelage being one of the diagnostic features said to differentiate *R. r. qinlingensis* (Wang et al., 1998).

Zhouzhi National Nature Reserve for the Golden Snub-Nosed Monkey (ZNNR)

The area containing the ZNNR is presumed to contained two free-living troops of *Rhinopithecus roxellana*. One, the East Ridge troop (ERT), was outside the ZNNR at the time of Li et al.'s (2000) study. The home range of the second, West Ridge Troop (WRT), was entirely within the reserve (Li et al., 2000). The area is within the distribution ascribed to *Rhinopithecus roxellana qinlingensis* (Wang et al., 1998)

West Ridge troop

The census of WRT in 1997 counted approximately 90 individuals (Li et al., 2000); 1998-1999 census put the number at approximately 95 (Ren et al., 2001). This troop is regularly provisioned and individual identification was possible due the high level of habituation, continual visual contact, and life history records. Whenever possible, identified individuals were used; when this was not possible, the behaviour of age/sex classes was documented. Table 8 describes the demographic listing for the primary focal OMU, JB unit. However, while highly unlikely, it should be noted that the Mother-daughter dyads of XK/DBC and YL/XBC could potentially be incorrect, with the relationships being XK/XBC and YL/DBC.

Table 8. Demographic data for JB unit.

Name (tag)	Age/sex class	Size Ranking (April'06)	Immigrated to unit	Maturity date	Birth Date	Sire	Dam	Offspring (Birth date/ Death date)	Comments
JB Male	Male	1	May 2003	Unknown	unknown	Unknown	unknown		Took over from male HT***
YL	Female	2		Unknown	unknown	Unknown	unknown	GY (2006) XY (2004) XBC (2001)	
XK	Female	3		Unknown	unknown	Unknown	unknown	QK (2005) ZK (2003; Deceased Oct, 2003) DBC (2001)	
BD	Female	4*		Unknown	unknown	Unknown	unknown		
YZM	Female	5*		2005	2000	Unknown	unknown	QY (2005)	

Name (tag)	Age/sex class	Size Ranking (April'06)	Immigrated to unit	Maturity date	Birth Date	Sire	Dam	Offspring (Birth date/ Death date)	Comments
DBC	Female/ Subadult	6**		2006	Unknown	Unknown	XK		
XBC	Female/ Subadult	7**		2006	Unknown	Unknown	YL	GXC (2006)	
XY	Juvenile	8			Mar 23, 2004	Assumed JB	YL		
QY	Juvenile	8			2005		YZM		
QK	Juvenile	8			Apr 2, 2005		XK		
GY	Infant	9			Mar 24, 2006		YL		
GXC	Infant	9			Apr 10, 2006		XBC		

** Very close in size*

*** very close in size, though XBC looks "younger"*

Explanation of categories in table 8.

Name (tag). The name given to the subject in this study by GSNM.
Age/Sex Class. Based on morphological features described above and age.
Size ranking. Based on personal observations of size and bulk. 1 was largest in group, 8 smallest. Juveniles and infants, both groups, were given the same ranking. No juvenile or infant was larger than any adult.
Immigration to Unit: date when subject was first identified in the unit (if not born with unit)
Maturity date: Personal communication from Qi Xiao-Guang. Assumed to be based on morphological features and, when known, birth date.
Birth date: The approximate date of birth. If birth occurred during an observation month, the date is more precise. Generally, birth dates were approximated by the GSNM, by calculating backwards from first observed appearance to likely birth date judging by level of physical development,
Sire: Personal communication from Qi Xiao-Guang, based on assumption resident male is the sire
Dam: Personal communication from Qi Xiao-Guang, female seen suckling the offspring and spending the greatest proportion of time with the subject.

Picture 1: Examples of Adult males (SWAP and ZNNR).

Picture 2: Examples of an Adult female (SWAP and ZNNR).

Picture 3: Example of Subadult male (NS of SWAP).

Picture 4: Examples of Subadult females (ZNNR).

Pictures 5: Examples of Immatures (SWAP and ZNNR).

Natal infant (ZNNR)

Infant (ZNNR)

Older juvenile and Older Infant (SWAP)

Borderline Older infants-Young juveniles

Young Juvenile (ZNNR)

Older Juvenile

Methodology Section 5: Study sites

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Summary

This chapter contains:

1. *A background to the development of the Shanghai Wild Animal Park,*
2. *Descriptions of Playground area,*
3. *Effects of loss of visual contact and disruptions to the study in the Playground area,*
4. *Descriptions of Caged female area,*
5. *Effects of loss of visual contact and disruptions to the study in the Caged female area,*
6. *A background to the development of the Zhouzhi National Nature Reserve,*
7. *Descriptions of Gongnigou Valley/Riverbed area,*
8. *Effects of loss of visual contact and disruptions to the study in the Gongnigou Valley/Riverbed area.*

1. Shanghai Wild Animal Park:

The Shanghai Wild Animal Park (SWAP) was the site for the captive (semi-free range) component of this study.

Development of the Shanghai Wild Animal Park

The SWAP (Shanghai Safari Park) is in Xuan Qiao Town, Nan-hui District, Shanghai, People's Republic of China. It was established by the Shanghai city government and the formal National Forest Department and opened in 1995 (Shanghai-Agriculture, http://en.shac.gov.cn.); it is one of the country's largest Wild Animal Parks governed on the state level (Shanghai Wild animal Park, http://lyw.sh.gov.cn/en/scenic_spot/wildap.html). The Golden snub-nosed monkey enclosure contained two of the more animal-friendly artificial habitats used for this species in captivity (Chris wood pers. comm.), and allowed a larger number of individuals to interact than other enclosures.

Captive study sites

The Captive study site consisted of two enclosures. The measurements of the enclosures, unless otherwise stated, were made by the author and Michael Voulgaropoulos using ten meter (10*13mm) fibreglass tape measure *(Ningbo great wall and bunkaseiko measuring tape manufacturing co, ltd)*.

Loss of visual contact (overall)

Each of the captive areas had potential "loss of visual contact" points. These will be discussed in relation to the dimensions of the sites below. A Loss of visual contact had two potential effects upon this study:

1. The **focal subject** could be lost from view, and
2. **Non-focal subjects** could be out of visual contact. This means they were not scored for Behavioural events such as Glance events.

2. Study Site 1: Playground enclosure

Figure 3 shows a stylised representation of the Playground enclosure, which is a large irregular shaped semi-free grassed area (Film 11 and 12: Playground area, Picture 1). A group of *R. roxellana* was first released into the enclosure in 1996, and in subsequent years more monkeys were added to group. The groups would be released from the night room between about 8 am and brought back indoors at 4:30-4:45 pm: observation sessions were run during this time. When the weather was exceptionally rainy, hot or cold, the monkeys were given access to the Night room, where observations were not possible, thus terminating the observation period.

The size of the Playground was difficult to estimate, in part because of its irregular shape. A previous study by Ren et al. (2003) calculated the original size of the Playground, described as an "island" and "outside habitat" in that study, at *ca.* 1000 m^2, but in August-September of 2000 it was rebuilt as *ca*. 900m^2 (Ren et al., 2003).

Approximately 3/5 of the circumference of the Playground is enclosed by a high fake stone wall, and a fifteen foot wide moat surrounds the remainder. The wall was manufactured to resemble sandstone, though the texture felt sturdier.

Directly across from the enclosure, separated by the moat, was divided into two sections of similar size. The first section was where visitors to the park could view the monkeys while noises and other disruptions from the tourists could reach the monkeys. The remaining area was bush and grassland fronting a large bird aviary.

A small 75-76 cm high three-wire fence separated the monkeys from the moat, but they could climb over, under and through it to reach the water's edge.

Platforms

The Playground enclosure contained three wooden roofed platforms, approximately 6 meters high and 4.23 meters wide, interconnected by chain metal bridges.

Water bowls

Two large concrete raised water bowls were located within the enclosure, and were the monkeys' only continual source of water apart from the moat (which they were never observed to drink from).

Waterfall

An irregular raised stone area surrounding an artificial waterfall, presumably the structure described as a “semicircle rockery” by Ren et al. (2003), was positioned against a stone wall. The waterfall was seen to be used once, for a short period, during the period of observations on the morning of 24^{th} of February, 2004.

Observation area within Playground

The Observation area consists of a flattened area above the rock wall above the main hallway, the entrance to night room. The structure of the rock meant that the monkeys could be observed at three main points between the “boulders”, where there was a clear view of a large section of the Playground.

3. Effects of loss of visual contact and disruptions to the study in the Playground area

Loss of visual contact.

The Playground contained 3 areas where there might be loss of visual contact. These were the wooden roofed platforms, the Hallways and the Rocky outcrops.

The wooden roofed platforms: On the sloping area of the roof opposite to the observation area, the monkeys would not be visible at certain times, although generally, enough of the body could be seen to identify the Behavioural events. At times, however not enough of the subject’s body could be seen to continue observations. Switching between observation points assisted in keeping visual contact.

***“Hallways” within the stone wall*:** The hallways were potentially exits and entrances for the keepers, but the one below the observation area (Hallway 1), directly beneath observation point 1, was the only one that was actually used.

Hallway 1: This was the point of origin for food and entry to the Caged area. The Caged area was where the rest of the captive *R. roxellana* were housed and could be observed through cracks in the door structure. At times, the monkeys would aggregate in Hallway 1, apparently attracted by the presence of females inside or the birth of a new infant.
Hallway 2: A portion of this hallway could be seen from all observation points. Variations in light and visibility made visual contact at the end of the hallway difficult, and Behavioural events were not recorded there because they could not always be confidently scored. The monkeys rarely occupied hallway 2.

Rock outcrops*:* There were two small areas against the rock wall (approximately 88 cm at the first outcrop and 1 metre at the second) hidden from visual range of the observer due to rock outcrops, but the monkeys rarely used them. The area lost from visibility was measured as shown in Figure 1.

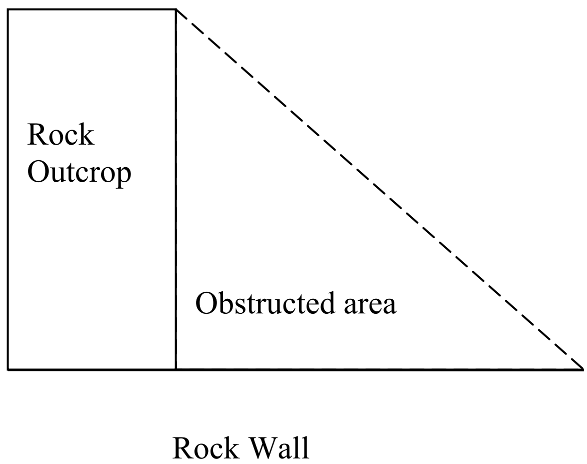


Figure 1: Stylized representation of Rock outcrop*
For dimensions see Rock outcrop section.

Potential disruptions to subjects' behaviour:

Periods of prolonged disruption were not included in the study for the Playground troop. There were five potential types of disruptions at the Playground study site:

Tourists: Efforts by keepers to stop tourists disturbing the monkeys, and signs to deter such activities, were usually ignored. Tourists were seen attempting to interact with the monkeys in various ways including:

1. **Loud noises** such as shouting and clapping, and the bullhorns used by tour guides,
2. Throwing of **food/drink stuff or rocks** at the subjects.

Monkeys would congregate at the water's edge at times when tourists threw food items into the enclosure.

The tourist disruptions were a continual problem with the Playground group for many years and it is unknown what effect this had on the behaviour of the monkeys, though it was possible that there were long term effects on behaviour, for example, the monkeys may have been more inclined to spend time near the water edge than they would have without the encouragement of tourists. Comparisons of periods with and without tourists present would not have been informative as the influx of tourists followed a regular daily pattern: low during the morning, rising to a peak near midday, and decreasing in the afternoon. The overall number of tourists increased during the summer months, and decreased during the cold weather.

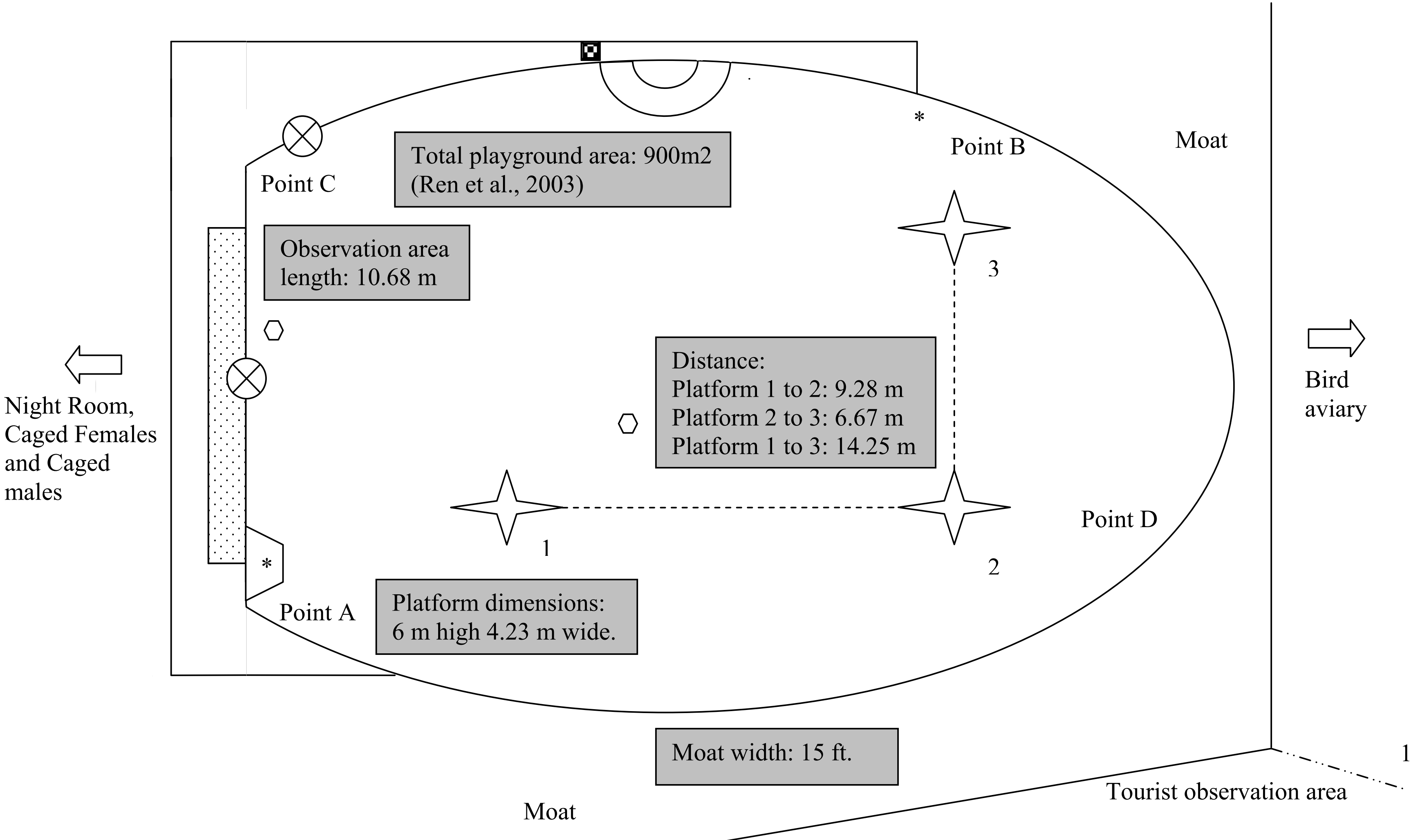
Peacocks and other birds: The latter (summer) months of the study coincided with a pair of peacocks nesting near the enclosure. There was one prolonged interaction between the subjects and the peacocks during one of the observation sessions (Film 13), though such interactions were otherwise rare. Birds (species unknown) would fly singly or in large numbers over the Playground area, appearing to elicit no response from the monkeys. On one occasion, however, a larger bird flew low over the enclosure and a number of the monkeys on the roof of the platforms moved rapidly to the covered portion.

Music: There was a constant stream of music from speakers near the pathways of the park, though it was fairly soft by the time it reached the observation area; it was assumed to have been a component of the monkeys' environment for a long period of time, just like the tourists. It was not possible to assess whether the music was having a measurable effect on behaviour, but my observations would suggest the monkeys had grown accustomed to it, as there was no apparent difference in behaviour during periods when environmental conditions (e.g. wind) led to the volume of the music reaching the enclosure increasing or decreasing. The Caged females group were exposed to radio noise at apparently random intervals (*see Study site 2: Potential disruptions to subject behaviour*) at a volume much greater than the music reaching the enclosure, yet this exposure did not appear to have an effect on the subjects' behaviour.

Fireworks: Fireworks could be heard going off in the direction of the bird aviary at rare and irregular intervals. The rarity of these events made estimating the effect on the monkeys difficult, though my observations would suggest a minimal effect as there was rarely a change in behaviour when the fireworks were heard.

Figure 2: stylised representation of the Playground area

Point A to B: 50.39m, Point C to D: 30.90 m.



Key:

Platform (1-3)

* Loss of visual-rock outcrop

Position of nesting peacocks

Water bowl

Chain ladder

Entrances

Observation area

Water fall area

Flatten stone area

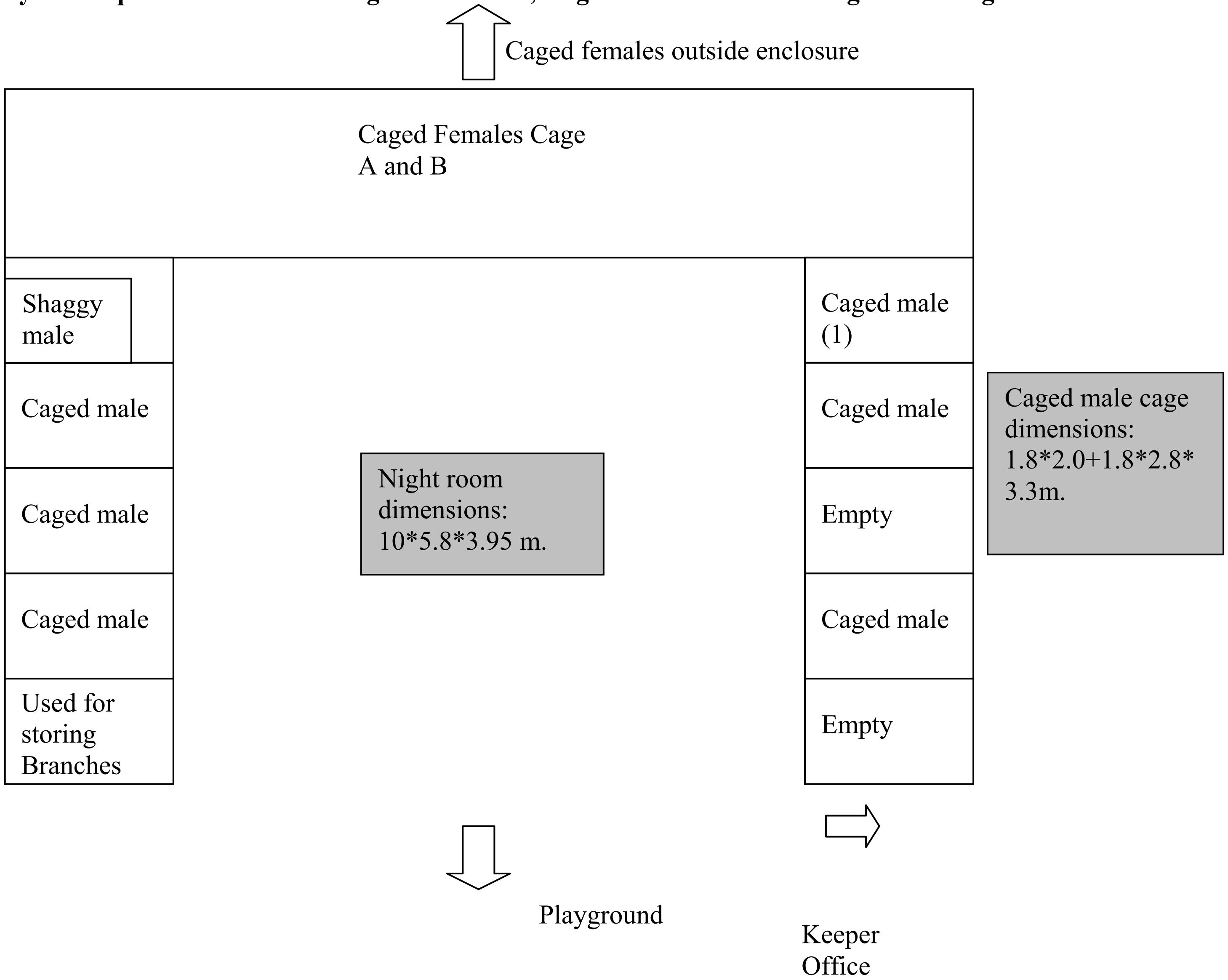
Caged Area

The Caged area was a section of the *R. roxellana* enclosure which contained the night room, the Caged males and the indoor component of the Caged females' area. Figure 3 shows a stylised representation of the night area, Caged females area (portion) and Caged male cages.

Night Room and Caged males

The Caged area contains the Caged males kept singly in cages measuring (1.8*2.0+1.8*2.8)*3.3 m (Picture 2: Caged male enclosures). Shaggy male (S) was in a smaller cage within a Caged male cage during some of the Caged females observation period. A Caged male, kept in Cage 1, was released into the Caged females' area at certain times during the observation period. The night area (Picture 3) consisted of a large 10*5.8*3.95 metre concrete room (Qi Jun Hua pers. comm.). Ren et al. (2003) reported the size of the night room as 20*5*2.8 m^3 before construction and 20*5*3.6 m^3 afterward. My own estimates, in based on the measurements of the Caged male cages, would suggest the size reported by Qi Jun Hua were correct at the time of this study. The variation may have been due to differing definition of what constituted the area of the night room or alterations to the overall size of the area between the study by Ren et al. (2003) and when the area was measured by Qi Jun Hua. The night room was where the subjects of the Playground group were housed overnight, between the approximate hours of 4:30-4:45pm and 8am. The Caged males' cages and the night room within the Caged area contained a concrete floor.

Figure 3: Stylized representation of the Night room area, Caged female area and Caged male cages*



4. Study site 2: Caged Female area

The Caged females area was located inside and adjacent to the Caged area. A group of *R. roxellana* were first released into the Caged female area (and the connected outside enclosure) in 1998, precipitated by the birth of OG and OBN, and in subsequent years more monkeys were added to the group. Figure 4 shows a stylised representation of the Caged female area: Cage A and B. The Caged females were given access before 10 am and were herded indoors, and access to the outside enclosure was closed, at approximately 4:30-4:45pm.

Cage A and Cage B

The Caged female area consisted of two separate cages, Cage A and Cage B, divided by a wire wall and connected by a door that remained open, permitting access between them. The two cages were 3.3 metres in height. The windowed area on the walls had a wire covering that allowed visual access to the outside. Monkeys were often seen climbing the wire coverings, as well as the wire walls. During the summer period, on hot days the keeper would open these windows and the doors to the Caged males, presumably to decrease the temperature within the Caged area; wire coverings over the windows and doors remained as a physical barrier. Cage B is shown in Picture 4 as an example of the inside of these cages (Cage A and B were very similar in their design).

On the 2nd July 2004, I undertook an all day observation session, observing from Cage A, the subjects being limited to Cage B, due to the requirement of allowing the Playground group access to the night room. The focus of this session was SHM. Observation under this protocol was performed once and was discontinued as it raised a number of concerns:

- The **disruption** this may have caused to the Caged females (Qi Jun-Hua, pers. comm.).
- The monkeys had **less space** than usual
- The observer's **visual range was different** than normal for observation sessions with the Caged females group; in particular there was visual access to the side area, which normally would be classed as loss of visual area.
- The **presence of the Playground group**. The two groups did not interact often, although Stumped tail often paced back and forth along the connecting wire wall

between the Playground and Caged females. On occasion the response to this (and others) could be considered low aggressive to medium aggressive: Stares to screams and confrontations between the wires.

Vertical Poles: Vertical poles were set about 4/5 of the distance from the ground within both cages. In the approximate centre of each cage was a tire held up by wire chains connected to the walls. Cage B contained a stone water bowl positioned next to the access to the outside and the doorway between the two cages.

Wooden Boxes: Both Cage A and B contained two large wooden boxes. The boxes were positioned in opposite corners of each cage, abutting the roof, reaching about 1/5 of the way to the ground. The boxes were accessible from the poles transecting the cages (opening at the front of the boxes), as well as from below where the floor consists of wooden bars, which the monkeys could squeeze through. Picture 5 shows an example of one of these wooden boxes.

Observation area

Observations of the Caged females group were collected from within the night room at a distance of 2.74 metres.

5. Loss of visual contact.

The Caged females enclosure contained two areas where potential loss of visual contact could occur.

Loss of visual contact side: Subjects that entered Wooden box 4 facing Wooden box 3 could not be observed from the observer's position because of the solid wall of the box. Subjects that entered Wooden boxes 1, 2 and 3 remained in visual contact through the wooden bars at the bottom and the entrances at the front of each box.

Loss of visual contact Caged female outside enclosure: The subjects had access to the outside enclosure and were lost from visual contact if they left the Caged area and went outside.

Potential Causes of Disruptions to Behaviour:

Five potential areas of disruptions were identified within the Playground study site. Periods of prolonged disruption were not included in the study for the Caged females troop.

Entrance of other people: To reach the Playground or office, people such as keepers needed to enter the night room, the small entrance area where they are visible to the Caged females. Those keepers who were known to the monkeys did not appear to elicit a response, but veterinary staff, park employees or unknown persons did seem to, and there was much agitated movement and, in extreme cases, they exited to the Outdoor enclosure till the person had left.

Administering medicine to the Caged male: One Caged male required the administration of a spray-on medicine, involving the keeper entering his cage and attempting to squirt the liquid onto the affected area, whereupon the male would often noisily climb and jump around his cage.

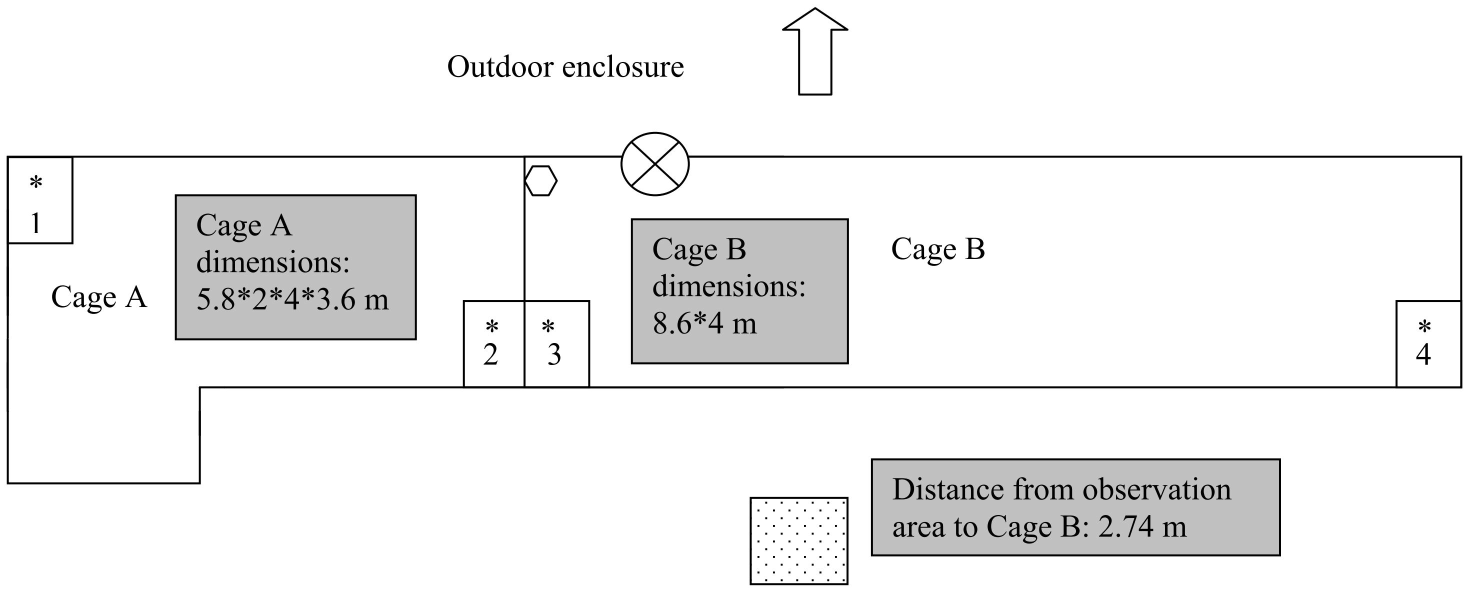
Feeding other subjects: The feeding of the Caged males, transporting food items for the Playground troop and the setting up of branches within the Night area for the Playground group, were all visible to the Caged females.

Feeding and administering medicine to the Caged males occurred at set times during the day, so any conclusion on the effect would be compounded by temporal effects: for example, feeding of the Caged males always occurred just prior to feeding of the Caged females group. Cautious personal observations would suggest that, like the music in the Playground group and the radio for the Caged females, they had habituated to these disruptions and their behaviours were not overly affected.

Noise: During the Observation sessions, the radio could be heard distinctly from the keepers' office but the noise did not appear to be affecting the monkeys.

Observer effect: In a few of the Caged females group observation sessions, it was necessary to approach the cages to obtain a better view of certain behaviours or subjects, and the juveniles, in particular, would attempt to interact or take notice of me. On even fewer occasions, my movement towards the cages coincided with some females becoming agitated, with aggressive stares and occasional vocalizations.

Figure 4: Stylized representation of Caged female area: Cage A and B*



Key

Water bowl

Entrances

Observation area

* Wooden box

The Caged females' outside enclosure:

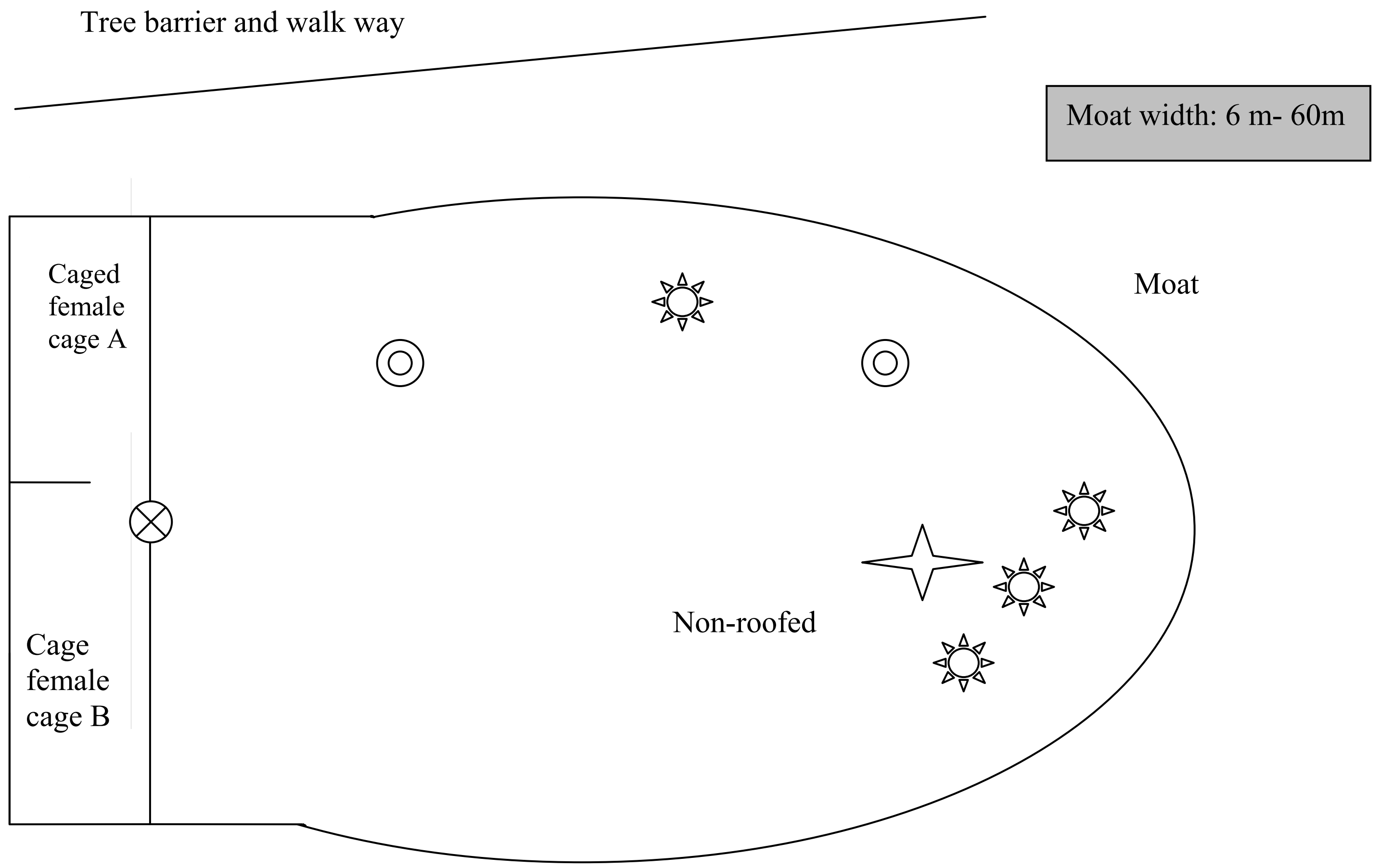
Figure 5 shows a stylised representation of Caged female area: outdoor enclosure. The outside enclosure contained one roofed and one unroofed wooden platform, similar in design to those in the Playground, and four large trees without leaves (Picture 6); it was surrounded by a moat varying in width from 6 metres to 60 metres, the widest section converting into some water based exhibitions near the opposite edge. On one side of the moat was a tree barrier between the tourists and the enclosure, which may have hindered any interaction with tourists. Other animal enclosures acted as barriers on other sides. The assumption that the Caged female area and the Playground enclosure were similar in size was a very crude approximation.

The Outside enclosure was not part of the study site for the Caged females for two reasons

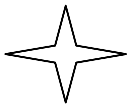
1. The lack of a practical **observation area**, and
2. They spent the greater portion of their **time in Cages A and B**.

Figure 5: Stylized representation of Caged female area: Outdoor enclosure

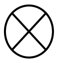
(*Dimensions assumed to be similar to the Playground.)*



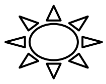
Key



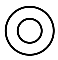
Platform



Entrance



Tree-without leaves



Trees-without leaves, connected by a chain ladder

A chain ladder also connects the closer of these two trees to the platform.

Comparison between the Playground and the Caged female enclosures

Table 1 details a rough comparison between the two enclosures.

Table 1: Comparison between Playground and Caged female enclosure

Characteristic	**Relative to each other**	
	Caged female enclosure	**Playground enclosure**
Days of high temperature	Observations could not be performed*	Observations could not be performed
Area over which observations were collected	Smaller area	Larger area
Weather influence	Less	Greater
Close exposure to humans	High	Low
Distant exposure to humans	Low	High
Enclosure	Indoor (Voluntary)	Outdoor (Involuntary)
Monkeys' preference	Indoor (Voluntary)	Indoor (when access was given)

** With one exception: See Study site 2: Caged Female area*

6. The development of the Zhouzhi National Nature Reserve

The Northwest University (Xian) has established a field station in the Yuhuangmiao village adjacent to the Zhouzhi National Nature Reserve for the Golden Snub-Nosed Monkey (ZNNR) on the northern slope of the Qinling Mountains. Base camp at this field station was located at 1400m above sea level asl. (Liu Jiu-Quan, pers. comm.)

Qinling Mountains

The Qinling Mountains are home to 20% of the wild Giant panda population, and contain almost 20% of the mammal species, 30% of the bird species and 8% of the amphibian species found in the Chinese mainland (Loucks et al., 2003 and studies cited therein). Père David's rock squirrel, *Sciurotamias davidianus* (Sheng et al., 1999, Picture 7) occurs in the Gongnigou valley in large numbers, as well as a small unidentified pika species (*Ochotona* sp. Picture 8). Eagles, hawks and snakes have been spotted within the mountain area as well. Dogs, chickens, semi-feral cats and cattle may also enter the area from the local village.

Zhouzhi National Nature Reserve for the Golden Snub-Nosed Monkey

The ZNNR, established on 1 January 1988, has been designated as a category V ("landscape" conservation) by the International Union for the Conservation of Nature and Natural Resources. The reserve contained 56393 hectares and was located 33¸47'17N (33.788°) - 108° 3' 58"E (108.066°) with an altitudinal range of 1,500 to 2904 meters. This information was obtained from the United Nations environment program (http://www.unepwcmc.org/wdpa/sitedetails.cfm?siteid=95793&level=nat).

Yuhuangmiao region

The study troop lives in the Yuhuangmiao region 108°14'-108°18'E, 33°45'-33°50'N (Li et al., 2000), described as a temperate zone with an altitudinal range of 1,400 to 2896 meters asl.(Li et al., 2000). Licensed logging has occurred in the region (Li et al. 1999), and logging by local residents was apparently quite extensive before the setup of the reserve but now is regulated (Qi Xiao-Guang, pers. comm.). A small amount was allowed by the local governing body, but policing was not widespread and illegal logging on a very small scale was tolerated (Qi Xiao-Guang, pers. comm.). The residents of the adjacent Yuhuangmiao village are predominantly subsistent farmers who supplement their income and livelihood through use of the surrounding forest areas for resources ranging from firewood, livestock feed, Chinese medicine, walnuts and food, collected illegally or otherwise. Residents obtain employment both as monkey trackers for the researchers in the area and as labour for improvements to the reserve for tourism.

During the study period for this project, the weather was very dry compared to previous seasons, resulting among other things, in a lower snow fall (Grou Sou-Tou, pers. comm.). The forest is described as coniferous and deciduous broadleaf (Ren et al., 2001, Li et al., 2000). Tables 2-5, adapted from Li et al. (2000), give a brief description of the physical characteristics of the area. The preferred habitat for *R. roxellana* in the Yuhuangmiao region was deciduous broadleaf forest (Li et al., 2000). Table 3 shows the breakdown of home range habitat type in the area. Table 4 shows home range by season within the Yuhuangmiao region.

Table 2: Physical characteristics of the Yuhuangmiao region (Li et al., 2000).

Month		**Season**
March-May		Spring
June-August		Summer
September-November		Autumn
December-February		Winter
Temperature	Average (95-97)	6.4^{o}C
	Minimum	-8.3 ^{o}C (recorded Jan)
	Maximum	21.7 ^{o}C (recorded Jul)
Average rainfall (95-97)		980 mm
Frost free days		150 days

Table 3: Physical characteristics of the Yuhuangmiao region (Li et al., 2000).

Altitude	**Vegetation type**	**Main plant species**	**Status**
1400-2200m	Deciduous broadleaf forest	*Quercus aliena* var.*acuteserrata* *Quercus liaotungensis* *Pterocarya macroptera* *Acer oliverianum*	Highly impacted from logging, predominantly focused on *Quercus* and conifers
2200-2600m	Coniferous and deciduous broadleaf mixed forest	*Populus purdomii* *Betula albo-sinensis* *Acer mono* *Carpinus turczaninowii* *Pinus armandii*	Conifers only on ridges. These are logged and replaced by *Betula*
2600-2896m	Coniferous forest	*Abies chensiensis* *Picea wilsonii* *Betula albo-sinensis* var. *septentrionalis* *Acer maximowiczii*	Little human impact

Table 4: Total (annual) home range breakdown based on forest type within Yuhuangmiao region (Li et al., 2000).

Percent (%) of home range	**Forest type**
77.5	deciduous broadleaf forest
20.8	coniferous/deciduous broadleaf mixed forest
1.7	coniferous forest

Table 5: Home range breakdown based on forest type across seasons within Yuhuangmiao region (Li et al., 2000).

Season	Percentage (%)	Description
Spring	82.4	Deciduous broadleaf forest
	17.6	Coniferous/deciduous broadleaf mixed forest
Summer	58.6	Deciduous broadleaf forest
	40.5	Coniferous/deciduous broadleaf mixed forest
	0.9	Coniferous forest
Autumn	76.5	Deciduous broadleaf forest
	23.5	Coniferous/deciduous broadleaf mixed forest
Winter	82.6	Deciduous broadleaf forest
	17.4	Coniferous/deciduous broadleaf mixed forest

Home range size varies considerably across seasons, being smallest in summer (9.5 km^2), largest in Spring (14.1 km^2) and 12.1 and 12.3 km^2 in Winter and Autumn, respectively (Li et al., 2000). Li et al.'s (2000) study areas within the home range suggest that for the Yuhuangmiao region the species' annual altitudinal range was 1510-2750 m asl.

There were two troops, West Ridge troop (WRT) and East Ridge troop (ERT), in Yuhuangmiao region (Li et al., 2000). The WRT, from now on referred to as the provisioned troop, was routinely provisioned during field trips.

7. Descriptions of Non-captive study site: Gongnigou Valley

The provisioning site was located in an area called Sanchakou within the Gongnigou valley, at 33^{O}48.42 N, 108^{O}15.68E (GPS 2000 Magellan TM, (PN 62010) 00-62010-005 (Assembled in Mexico); Liu Jiu-Quan pers. comm.). The Northwest University Golden Snub-Nosed Monkey Research Centre (GSNM) has habituated the provisioned troop for over ten years (see Ren et al., 2001) to the presence of small numbers of people, usually researchers. Within the Gongnigou Valley, observations can occur from distances ranging from 5-50 metres. This is where the majority of this part of the study was performed. Figure 5 is a stylized drawing of the main area of the valley where the study was performed (not to scale). Because of the variable nature of the physical characteristics of the area, measurements are not included. Table 6 ranks the combination of visibility of the subjects and accessibility of the key areas within this Valley.

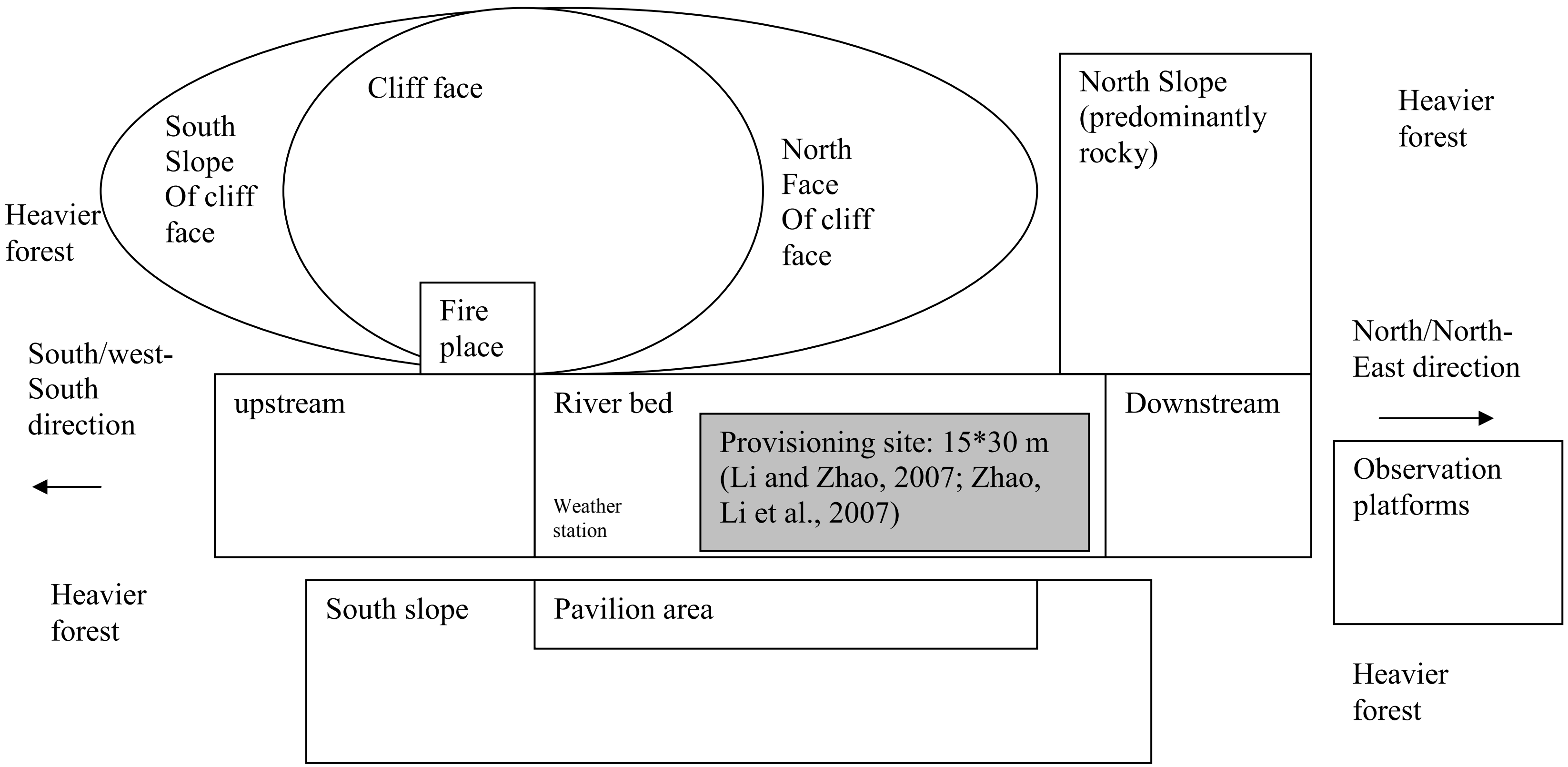


Figure 5: Stylized Drawing of the Gongnigou Valley, riverbed area

Table 6 Combined visibility of the subjects and accessibility ranking of the key areas within Gongnigou Valley (loss of visibility)

Rank	Area	Description
1	River bed (Picture 9).	Clear visibility, easy access; if subjects headed towards the opposite slope and continued high up the slope, they could be difficult to follow if there was another OMU in the river bed area blocking access to the other slope.
2	South slope	Ease of visibility was not as great as north slope but greater accessibility and ability to get close to subjects without potentially disturbing any members of the troop.
3	North slope (Picture 10)	Clear visibility offset by difficult terrain; the low number of trees meant that the monkeys spent a lot of time on the fringes (heavy forest area).
4	Downstream	Heavy foliage made visibility hard and accessibility difficult. Observation platforms may have contained tourists.
5	Cliff face	Beyond cliff face: poor visibility and very poor accessibility unless already upon the cliff face and even then very dangerous. Cliff face proper: excellent visibility.
6	Heavy forest areas (Picture 11).	Low visibility and rough terrain made following subjects difficult, combined with their general high speed of movement within these areas.

Potential disruptions to subjects' behaviour

Human activity in Gongnigou valley, riverbed area: Table 7 lists some of the irregular activities in or near the Gongnigou valley seen during this study.

Table 7. Some of the irregular activities in or near the Gongnigou valley observed during this study

Human activity	Description
Fire	The farmers hired for tracking and herding the monkeys would light small fires during the colder months, generally away from the study area and not in close proximity to any subjects. A fire would also be lit within the fireplace area.
Entrance of the Research area	Tourists and visitors to the valley would at times attempt to move beyond the observation platforms and onto the riverbed area proper, usually the pavilion. This was generally discouraged by the researchers and Park management.
Construction	At times, loud noises, the use of chemical paint and so forth. Noises from the village below could sometimes be heard faintly as well.
Snake deterrent	On the 24th of May 2005, one of the GSNM researchers doused a very small part of the pavilion area at the bottom of the south slope and later higher in the south slope with a highly diluted H_2SO_4 solution to deter snakes. Both treated areas were small and out of the regions where the monkeys usually were found.
Removal of noxious weeds	The riverbed area contained a fast growing weed species (species unknown) whose leaves were covered in a number of small thorns that could easily irritate the skin when brushed against. During the first spring/summer season, these were destroyed by hand as it was possible that they would harm the monkeys when they entered the riverbed to feed on the provisions.

My observations would suggest that the effects of these activities on the monkeys were minimal. I selected, as focal subjects, individuals that were away from the core area of the study site and the long term exposure of this troop to the human activities listed above (excepted for use of snake deterrent), though *R. roxellana* is easily disturbed by human activities, as suggested by Li et al. (1999).

Tourism developments in the Gongnigou Valley area: Throughout 2005-2006, the ZNNR management was in the process of establishing a tourist visiting area adjacent to the riverbed area, in particular the construction of observation platforms and improvements to the path leading to the valley. Development during the study period began in earnest around 22nd May 2005 and included improvements to the roads leading to the adjacent village, repairs to the bridges, establishment of a concrete stepway to the provisioning site, rudimentary signs highlighting the way to the provisioning site, and the construction of three viewing platforms. There has also been expansion and improvements to the Reserve management base to house a number of tourists for extended periods. Concerns have been raised about the impact of tourism to the area and the troop (Researchers pers. comm.). Tourists to the area sometimes leave the designated viewing platforms and enter the provisioning area proper, attempt to interact with the troop through noises and food, use flash photography, and leave garbage around the area (Picture 12). The removal of forest items by visitors and damage to the flora within the provisioning and research area were also a possible concern. Conjunct efforts by researchers and the reserve management in the form of signs along the path to the provisioning and research area encouraging the visitors to remain quiet have been established. The ZNNR management is actively seeking to increase the number of tourists visiting the reserve each year.

Paint marking and hair sampling of subjects: Predominantly during the identified focal subject data sampling period (later months of the field study), the GSNM initiated an extensive marking program (utilizing a mixture of publicly available paints and alcohol, to act as a thinner). Concurrently, a selective hair sampling project was initiated. Marking consisted of attracting selected individuals towards the marker by use of provisions (during provisioning times) and "spot" marking with paint mix ejected from a syringe. Hair sampling was conducted by use of a stick with a sticky pad on the end. To avoid contamination of the behavioural data collected for this study, subjects utilized in this study, for example JB unit, were not sampled or marked during data collection. When the individuals within JB unit were marked and sampled, the OMU was not used as a focal for at least two days to allow recovery (generally the period was longer, but never less). Other subjects selected for focal study were not hair sampled or marked during that day of data collection, and whenever possible individuals were selected as being from the OMU with the longest period since being marked or hair sampled. Subjects used for timed events were either part of focal OMU, and thus had the longest possible period since marking, or were selected on the basis of not being marked or their marking appearing faded, plus distance from the hair sampling area, to increase the likelihood they were not hair sampled recently.

8. Effects of loss of visual contact and disruptions to the study in the non-captive study sites

Loss of visual contact

The number of potential loss of visual contact points was much greater for the Provisioned troop than for the study groups in Shanghai Wild Animal Park. Naturally occurring obstacles such as trees, foliage, rocks, cliff faces all acted as loss of visual contact points, particularly when the subjects were in locomotion. The position of the sun, and amount of light present, was also a factor, which had not been a problem in the captive study, because of the observer's point of view in relation to the subjects (at ZNNR often below the subjects, looking up).

Comparison between the Captive and non captive study sites.

Table 8 details a rough comparison between the captive and non captive study sites. It should be noted that each of the levels described here are only in relation to the other option and not an overall measurement.

Table 8: Comparison between the Captive and non captive study sites.

Characteristic	Relative to each other	
	Gongnigou Valley	**Captive study sites**
Days of high temperature/low temperatures	Observations could be performed*	Observations could not be performed for high temperatures
Area over which observations were collected	Larger area	Smaller area
Weather influence	Less*	Greater
Close exposure to humans	Low	High
Distant exposure to humans	Low	High
Enclosure	Outdoor	Indoor/ Outdoor
Preference of enclosure	Not applicable	Indoor (when access was given)
Continual visibility	Low	High

- Weather extremes could a deterring factor for researchers and herders.

Picture 1: Playground area (SWAP).

Picture 2: Caged males enclosures (SWAP)

Picture 3: Night Room (SWAP).

Picture 4: Caged females area: Cage B (SWAP).

Picture 5: Example of Wooden Box fixture in Caged females area (SWAP)

Picture 6: Caged females group outdoor enclosure (SWAP).

Picture 7: Père David's rock squirrel, *Sciurotamias davidianus*

Picture 8: small unidentified pika species (possibly *Ochotona* sp.) of the order Lagomoprha

Picture 9: Riverbed area (ZNNR).

Picture 10: North Slope (ZNNR).

Picture 11: Surrounding area of Riverbed area (ZNNR).

Picture 12: Tourists outside tourist designated areas (ZNNR).

Result Section 1: Observation times

The Playground Group

The Playground group was observed in the months of February, March and April. The overall hours of focal observation for each subject ranged from 31.71 to 24.46 hours, with an average of 29.54 hours (Table 1).

Table 1: Observation times (hours) for the Playground group (2004)

Subject	**Before division***	**After division***	**Total hours**
OMU Male (OMU)	31.50	0	31.5
Shaggy female (SF)	21.05	8.39	29.44
Non-Shaggy Female (NSF)	24.26	Not applicable	24.26
Big Breasted, Small Gut (BBBG)	20.65	11.06	31.71
Big Breasted, Big Gut (BBSG)	23.7	7.09	30.79
Average hours	24.23	6.64	29.54

*** Division = Removal of NSF.**

The Caged female group

The Caged female group was observed in the months of May, June and July. The overall hours of focal observation for each subject ranged from 30.11 to 23.55 hours, with an average of 27.20 hours (Table 2).

Table 2: Observation times (hours) for the Caged female group (2004)

Subject	With Male*	Without Male*	Total hours
Shaggy haired, Mohawk (SHM)	2.21	26.75	28.96
Orange Girl (OG)	10.01	20.26	30.11
Orange, Big nipples (OBN)	15.09	7.88	23.55
Big Breasted, Big girl (BBBG2)	9.89	18.00	27.89
White Chest (WC)	11.40	14.12	25.52
Average hours	9.72	17.40	27.20

The JB unit

The JB unit was observed in 2005 and 2006. The overall hours of focal observation for each subject ranged from 23.22 to 15.78 hours, with an average of 17.73 hours (Table 3).

Table 3: Observation times (hours) for the JB unit (2005-2006)

Subject	Before division*	After division*	Total hours
YL	14.75	8.46	23.22
XK	5.39	10.98	16.34
XBC	6.61	9.16	15.78
JB male	7.86	7.27	15.14
DBC	7.06	10.23	17.29
BD	7.31	9.73	17.04
YZM	10.20	9.11	19.31
Average hours	8.45	9.28	17.73

*** Division = Birth season.**

Unidentified individuals within the Western Ridge troop.

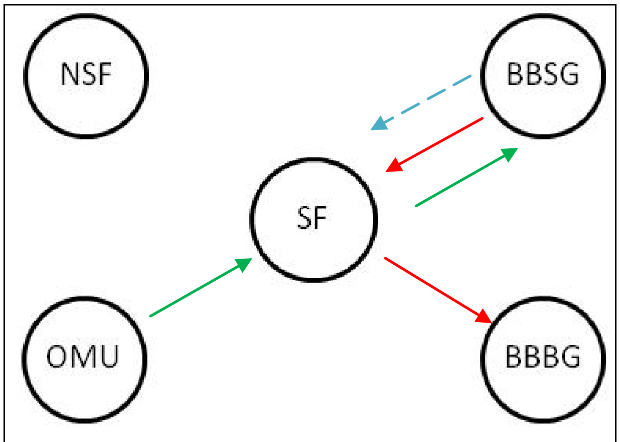
Individuals identified to their Age/Sex categories were observed in 2005 and 2006. The overall hours of focal observation for each subject ranged from 28.56 to 69.17 hours, with an average of 52.87 hours (Table 4).

Table 4: Observation times (hours) for WRT unidentified individuals (2005-2006)

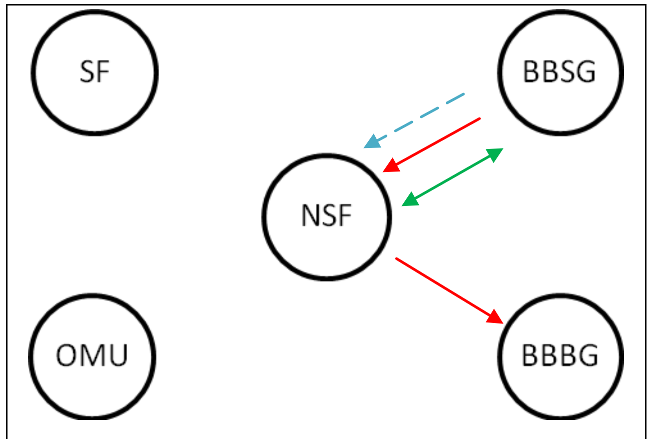
Subject	**Total hours**
Male	60.89
Adult Female	69.17
Subadult female	28.56
Average hours	52.87

Results Section 2: Socio-grams for the Playground group

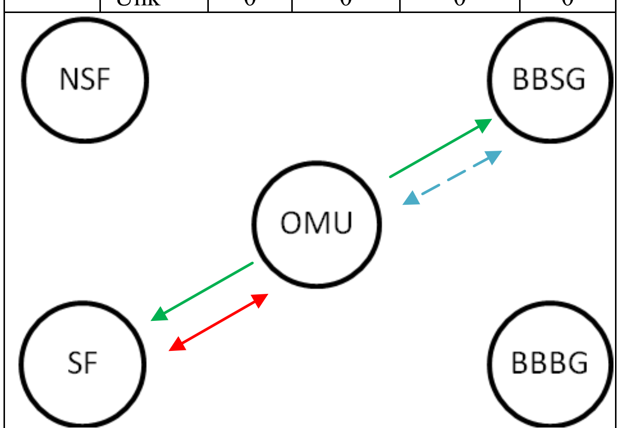
Figure 1: Socio-grams for the Playground group before the removal of NSF



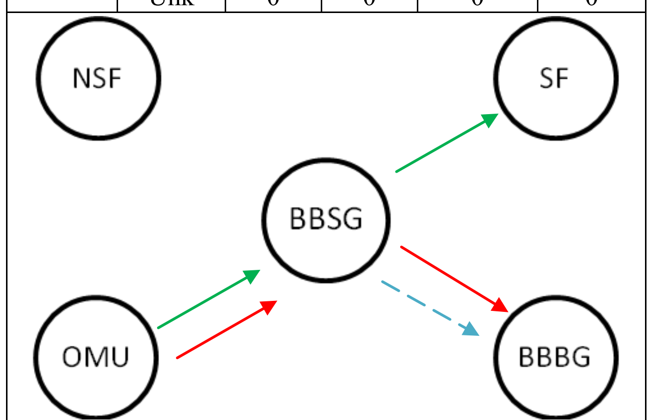
POV=SF		NSF	BBSG	BBBG	OMU
Aff.	Init[1/2]	24	63	38	55
	Rec[1/2]	0	83	10	87
	Unk	1	8	1	7
Agon.	Init.	0	2	5	2
	Rec	0	18	0	10
	Unk	0	1	0	1
Other	Init	0	0	0	0
	Rec	0	6	0	1
	Unk	0	0	0	0



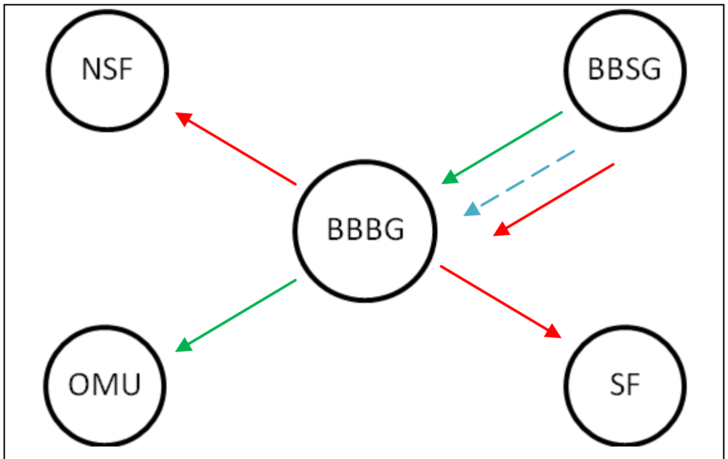
POV=NSF		OMU	SF	BBSG	BBBG
Aff.	Init	24	4	26	6
	Rec[1/2]	36	20	73	6
	Unk	3	10	13	0
Agon.	Init[3/4]	0	2	1	12
	Rec	1	2	13	1
	Unk	0	0	0	0
Other	Init	0	0	0	0
	Rec	0	0	14	0
	Unk	0	0	0	0



POV=OMU		NSF	SF	BBSG	BBBG
Aff.	Init[1]	24	116	84	18
	Rec[1]	22	59	84	14
	Unk	0	9	24	1
Agon.	Init	0	6	2	1
	Rec	0	1	0	0
	Un.	0	0	0	0
Other	Init	0	0	1	0
	Rec	0	0	1	0
	Unk	0	0	0	0



POV=BBSG		NSF	OMU	BBBG	SF
Aff.	Init[1/2]	57	80	42	86
	Rec[1/2]	23	68	8	55
	Unk	6	17	4	7
Agon.	Init	7	3	15	9
	Rec	0	4	0	0
	Un.	0	0	0	0
Other	Init	4	2	5	3
	Rec	0	0	0	0
	Unk	0	0	0	0



POV=BBBG		NSF	OMU	BBSG	SF
Aff.	Init[5]	2	22	14	18
	Rec[1/2]	9	29	42	37
	Unk	0	4	3	4
Agon.	Init.	1	0	0	1
	Rec[1/2]	7	4	26	9
	Unk	0	0	0	0
Other	Init	0	0	0	0
	Rec	0	0	3	0
	Unk	0	0	0	0

Key:

: Preferred direction of agonistic events (Agon.)

: Preferred direction of affiliative events (Aff.)

: Preferred direction of Other events (Other)

Init: Initiated by Focal, **Rec:** Received by Focal

Unk: Unknown initiator of event

POV: Point of view/Focal subject

[1]=Social unit(SU): $p<0.00$, df:3, [2]= Social unit females(SUF): $p<0.000$, df: 2,

[3] =Social unit(SU): $p<0.001$, df: 2, [4]= Social unit females(SUF): $p<0.001$, df:2

[5]= Social unit(SU): $p<0.001$, df:3

Figure 1 shows the socio-grams for the playground group before the removal of NSF. Appendix 1 shows the categorization of the Behavioural events into Affiliative, Agonistic and Other event categories for this study.

Affiliative preferences

Mother-daughter dyad

Within the mother-daughter dyad (SF and BBSG), the preferred affiliative behavioural partner was each of these females' genetic relative. BBSG (her POV) directed more Affiliative events towards SF than towards any other individual (SU: $p<0.000$, df: 3, SUF: $p<0.000$, df: 2). Even though BBSG (POV) received significantly more Affiliative events from OMU overall, among the females, SF was preferred (SU: $p<0.000$, df: 3, SUF: $p<0.000$, df: 2). SF (POV) also showed a significant preference for BBSG. SF (POV) directed more Affiliative events towards BBSG than towards any other individual (SU: $p<0.000$, df: 3, SUF: $p<0.000$, df: 2), followed by OMU. Similar to BBSG, SF received significantly more Affiliative events from OMU than from any other subject (SU: $p<0.000$, df: 3) followed very closely by her relative, BBSG (SUF: $p<0.000$, df: 2).

Reproductive status

It should noted also that both members of the Mother-daughter dyad were nursing infants, and these two, as well as the other nursing female (NSF), all showed affiliative preferences for each other. NSF (POV) directed significantly more Affiliative events towards BBSG than towards other single individual, and she also received significantly more Affiliative events from BBSG than from any other subject (SU: $p<0.000$, df: 3, SUF: $p<0.000$, df: 2).

Age related: Male preference for Younger individuals

The male (OMU) directed more affiliative events towards SF over the entire social unit (SU: $p=0.000$, df: 3), even though he received more affiliative events from BBSG (SU: $p<0.00$, df: 3). He showed the least amount of interest in BBBG, the only individual present with no infant. OMU (POV) had the lowest preference for BBBG and initiated and received the lowest number of Behavioural events (in all categories) with her. It should be also noted that the male was rarely the overall preferred recipient of female initiated affiliative interactions (Multiple POVs) with only the non nursing female, showed an affiliative preference for him (from BBBG Point of views). BBBG (POV) directed significantly more affiliative events towards OMU (SU $p<0.001$, df: 3) even though she received more from BBSG than any other subject (SU: $p<0.000$, df: 3, SUF: $p<0.000$, df: 2).

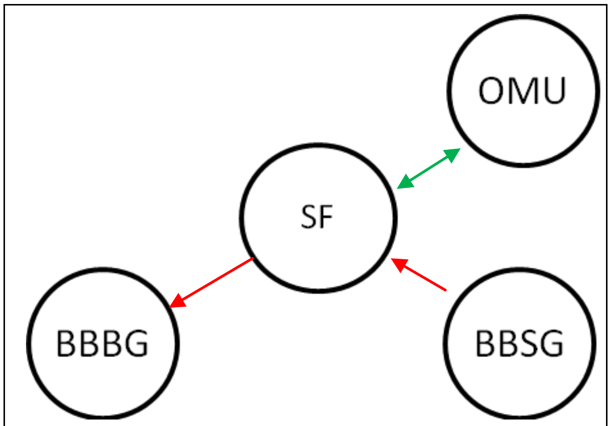
Agonistic interactions: Towards a non nursing female

For agonistic interactions, the data suggest that all females directed more of their aggression towards the only female without an infant (BBBG). BBBG (POV) directed Agonistic events only towards SF and NSF, while she received Agonistic events from all members of the SU. She received significantly more Agonistic events from BBSG than from any other individual (SU: $p<0.000$, df: 3, SUF: $p<0.000$, df: 2). Judging by her size and reproductive output (see methodology), she was likely the youngest individual, second only to SF. OMU (POV) directed more agonistic events towards SF (his affiliative preference) than any other subject, while SF (POV), like most females, directed more aggression towards BBBG, though she received more from her mother, BBSG. NSF (POV) directed significantly more agonistic events towards BBBG (SU: $p<0.001$, df: 2, SUF: $p<0.001$, df: 2) while she received more aggression from BBSG (SU: $p<0.000$, df: 3). BBBSG (POV), on the other hand, received aggression only from OMU but also directed more events towards BBBG.

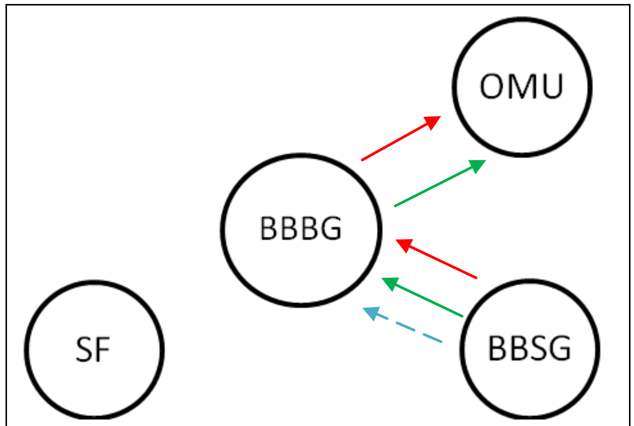
Other preference.

In terms of Other events, BBSG was one of the more common partners for all other members of the Social unit (Multiple POVs).

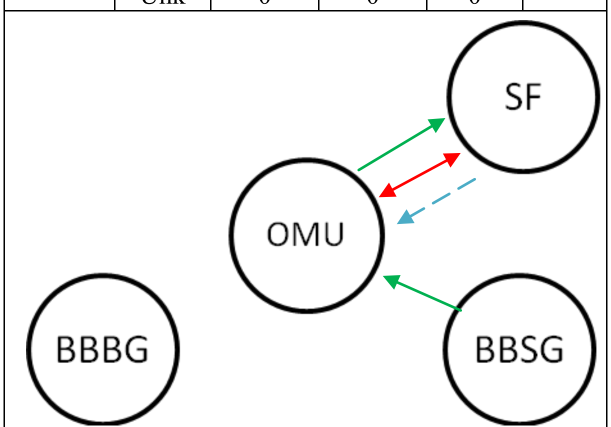
Figure 2: Socio-grams for the Playground group after the removal of NSF



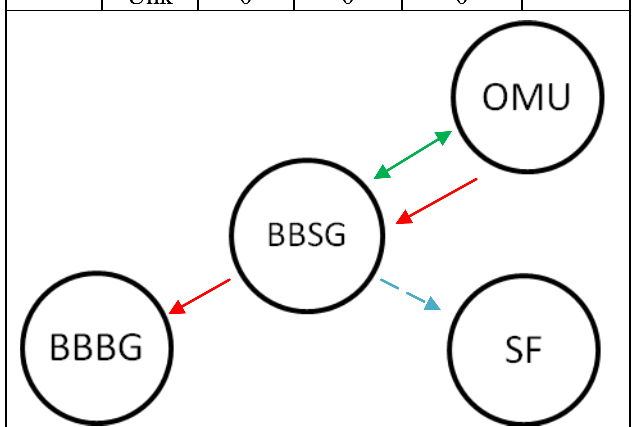
POV=SF		BBSG	BBBG	OMU	NSF
Aff.	Init[2]	49	29	53	***
	Rec[1/2]	43	3	53	***
	Unk	8	7	6	***
Agon.	Init.	0	3	2	***
	Rec	4	0	3	***
	Unk	0	0	0	***
Other	Init	0	0	0	***
	Rec	0	0	0	***
	Unk	0	0	0	***



POV=BBBG		OMU	BBSG	SF	NSF
Aff.	Init	8	4	4	***
	Rec	26	32	21	***
	Unk	6	4	0	***
Agon.	Init.	3	0	0	***
	Rec	1	7	2	***
	Unk	0	0	0	***
Other	Init	0	0	0	***
	Rec	0	2	0	***
	Unk	0	0	0	***



POV=OMU		SF	BBSG	BBBG	NSF
Aff.	Init[3]	65	61	18	***
	Rec[3]	70	71	8	***
	Unk	3	21	2	***
Agon.	Init	3	0	0	***
	Rec	1	0	0	***
	Un.	0	0	0	***
Other	Init	0	0	0	***
	Rec	1	0	0	***
	Unk	0	0	0	***



POV=BBSG		OMU	BBBG	SF	NSF
Aff.	Init[1/2]	76	27	58	***
	Rec[1/2]	49	4	23	***
	Unk	25	8	7	***
Agon.	Init	0	7	3	***
	Rec	1	0	0	***
	Un.	0	0	0	***
Other	Init	0	1	2	***
	Rec	0	0	0	***
	Unk	0	0	0	***

Key:

← **:** Preferred direction of agonistic events (Agon.)

← : Preferred direction of affiliative events (Aff.)

⇠ : Preferred direction of Other events (Other)

Init: Initiated by Focal, **Rec:** Received by Focal

Unk: Unknown initiator of event

POV: Point of view/Focal subject

[1]=Social unit(SU): p<0.00, df:2, [2]= Social unit females(SUF): p<0.000, df: 1,

[3]= Social unit(SU): p<0.000, df: 3

Figure 2 shows the socio-grams for the Playground group after the removal of NSF.

Affiliative preferences:

Preference for the Male.

During these sessions there was a shift to the male (OMU) as the preferred interaction partner for all the females, even though the Mother-daughter preference was still present compared to other potential female partners. BBSG(POV) directed significantly more Affiliative events towards OMU and, among the females, SF (SU: p<0.000, df: 2, SUF: p<0.000, df: 1); conversely OMU, followed by SF, directed significantly more Affiliative events towards BBSG (SU: p<0.000, df: 2, SUF: p<0.000, df: 1). SF (POV) directed more Affiliative events towards OMU than towards any other individual, followed by BBSG (SUF: p<0.000, df: 1). SF received significantly more Affiliative events from OMU than from any other subject (SU: p<0.000, df: 2), followed by BBSG (SUF: p<0.000, df: 1). OMU (POV) directed significantly more Affiliative events towards SF than towards any other individual, followed closely by BBSG (though a large number of affiliative events were recorded without an obvious initiator), and also received significantly more Affiliative events from BBSG than from any other subject (SU Initiated/received $p<0.000$, df: 3), followed very closely by SF. BBBG (POV) directed more affiliative events towards OMU as well, whilst receiving more from BBSG.

Agonistic and Other preferences.

In terms of aggression and other events, little changed. The majority of Agonistic events involved BBBG. BBSG (POV) directed more Agonistic events towards BBBG than towards any other individual. Even though BBBG (POV) directed Agonistic events only towards OMU, she received Agonistic events from all members of the SU but received more from BBSG than from any other individual. SF (POV) directed more Agonistic events towards BBBG than towards any other individual, while she received more from BBSG than any other subject. SF was the most common partner for Agonistic events (From BBSG and OMU POV).

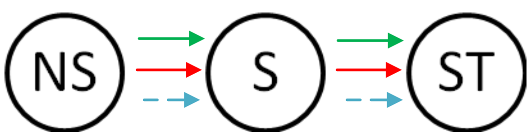
BBBG (POV) received the only Other events from BBSG. OMU (POV) was involved in1 Other event, received from SF. BBSG(POV) directed two Other events, one each to SF and BBSG. BBSG was the only subject to direct Other events toward BBBG, from BBBG POV as well.

Results Section 2: Socio-grams for AMU

Figure 1: Socio-grams for the AMU before the removal of NSF

POV=NS		**S**	**ST**
Aff.	Init	114	186
	Rec[1]	46	66
	Unk	3	10
Agon.	Init.	0	43
	Rec	24	24
	Unk	0	8
Other	Init	0	15
	Rec	4	3
	Unk	0	0

POV=ST		**S**	**NS**
Aff.	Init[1]	18	50
	Rec	98	133
	Unk	10	17
Agon.	Init.	0	11
	Rec	17	17
	Unk	0	2
Other	Init	0	0
	Rec	4	3
	Unk	0	0



POV=S		**ST**	**NS**
Aff.	Init[1]	107	57
	Rec[1]	24	170
	Unk	10	14
Agon.	Init.	19	17
	Rec	1	10
	Unk	0	0
Other	Init	4	0
	Rec	0	13
	Unk	0	0

Key:

: Preferred direction of agonistic events (Agon.)

: Preferred direction of affiliative events (Aff.)

: Preferred direction of Other events (Other)

Init: Initiated by Focal, **Rec:** Received by Focal

Unk: Unknown initiator of event

POV: Point of view/Focal subject

[1]=Social unit (SU): p<0.00, df:1

Figure 1 shows the socio-grams for the All male unit (AMU) that cohabited the playground area with the Playground group, before the removal of NSF.

Affiliative preferences:

S (POV) directed significantly more Affiliative events towards ST than NS, and he also received significantly more Affiliative events from NS than ST (Initiated/received: SU: $p<0.000$, df: 1). NS (POV) directed more Affiliative events towards ST than S, and he also received significantly more Affiliative events from ST than S (SU: $p<0.000$, df: 1). ST (POV) directed significantly more Affiliative events towards NS than towards S (SU: $p<0.000$, df: 1), and he also received more Affiliative events from NS than from S.

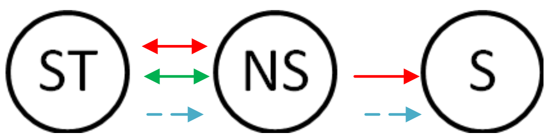
Agonistic preferences:

S (POV) directed more Agonistic events towards ST, while he received more Agonistic events from NS. NS (POV) directed all Agonistic events he initiated towards ST, while he received an equal number of Agonistic events from ST and S. All Agonistic events initiated by ST (POV) were directed towards NS. ST (POV) received an equal number of Agonistic events from NS and S.

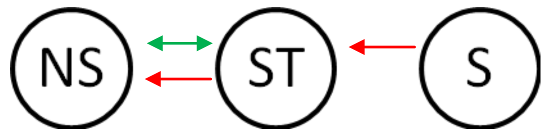
Other preferences:

S (POV) initiated all Other events towards ST, and received all Other events from NS. All Other events initiated by NS (POV) were directed towards ST, while he received more Other events from S than ST. ST (POV) received 7 Other events with more received from S than NS, without initiating any himself.

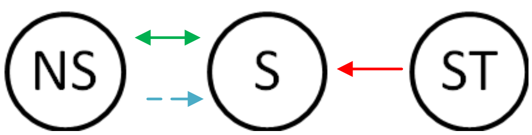
Figure 2: Socio-grams for the AMU after the removal of NSF



POV=NS		S	ST
Aff.	Init	33	39
	Rec[1]	10	34
	Unk	4	7
Agon.	Init.	1	1
	Rec	4	6
	Unk	0	0
Other	Init	4	1
	Rec	0	1
	Unk	0	0



POV=ST		S	NS
Aff.	Init[1]	5	26
	Rec[1]	8	35
	Unk	2	14
Agon.	Init.	2	5
	Rec	5	0
	Unk	0	0
Other	Init	0	0
	Rec	0	0
	Unk	0	0



POV=S		ST	NS
Aff.	Init	3	7
	Rec[2]	9	29
	Unk	0	1
Agon.	Init.	0	0
	Rec	8	0
	Unk	0	0
Other	Init	0	0
	Rec	0	4
	Unk	0	0

Key:

: Preferred direction of agonistic events (Agon.)

: Preferred direction of affiliative events (Aff.)

: Preferred direction of Other events (Other)

Init: Initiated by Focal, **Rec:** Received by Focal

Unk: Unknown initiator of event

POV: Point of view/Focal subject

[1]=Social unit(SU): $p<0.000$, df:1,

[2]=Social unit(SU): $p<0.001$, df:1

Figure 2 shows the socio-grams for the AMU that cohabited the playground area with the Playground group, after the removal of NSF.

Affiliative preferences:

NS (POV) both directed more Affiliative events towards ST than towards S, and received more Affiliative events from ST (SU: $p<0.000$, df: 1). S (POV) directed more Affiliative events towards NS than towards ST, and received more from NS than from ST (SU: $p<0.001$, df: 1). ST (POV) both directed significantly more Affiliative events towards NS than towards S (SU: $p<0.000$, df:1) and received more from NS (SU: $p<0.000$, df:1).

Agonistic preferences:

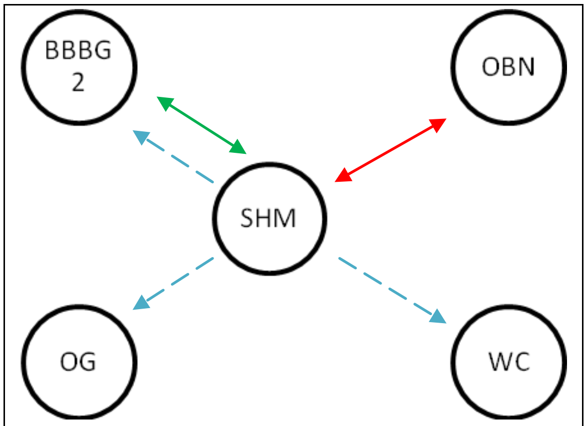
NS (POV) directed equal numbers of Agonistic events towards ST and S, while he received more Agonistic events from ST than from S. S (POV) was involved in 8 Agonistic events overall, all received from ST. ST (POV) directed more Agonistic events towards NS, while he received Agonistic events only from S.

Other preferences:

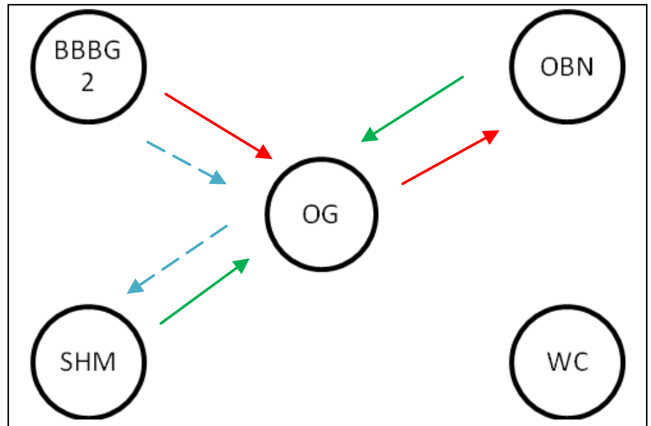
NS (POV) directed more Other events towards S than ST and received the only 1 Other event directed towards him, from ST. S (POV) was involved in 4 Other events overall, all received from NS.

Results section 2: Socio-grams for Caged females group

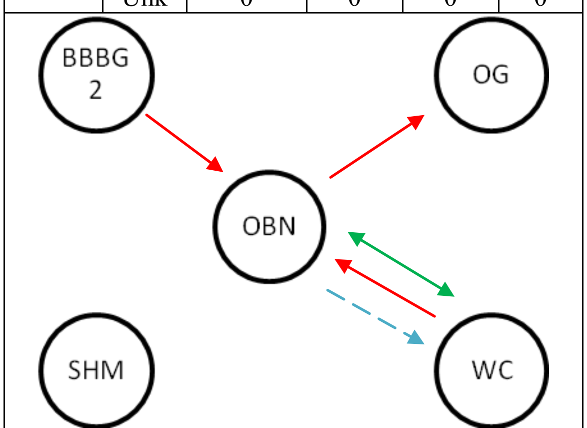
Figure 1: Socio-grams for the Caged female group during sessions without the introduced male.



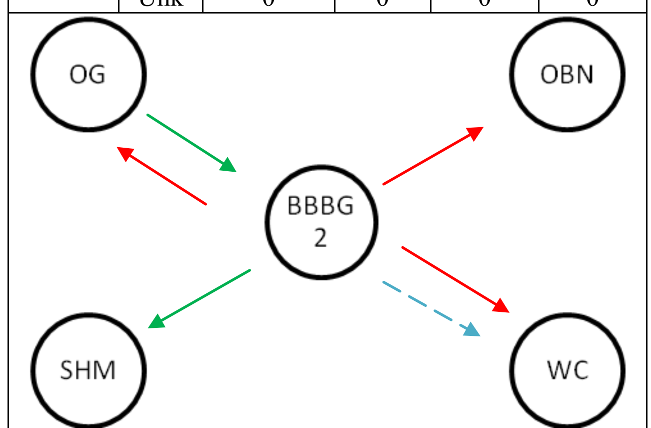
POV=SHM		BBBG2	OBN	OG	WC
Aff.	Init[1]	64	23	37	50
	Rec[1]	69	30	64	40
	Unk	20	6	8	17
Agon.	Init.	0	2	1	0
	Rec	1	2	0	0
	Unk	0	0	0	0
Other	Init	1	0	1	1
	Rec	0	0	0	0
	Unk	0	0	0	0



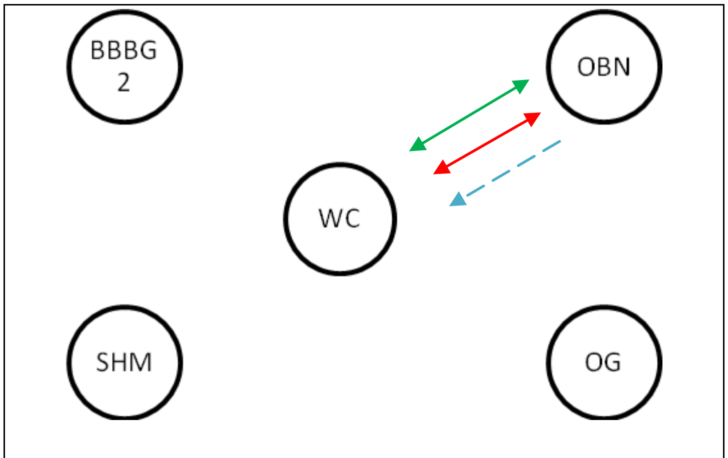
POV=OG		BBBG2	OBN	SHM	WC
Aff.	Init	47	28	51	42
	Rec	21	28	15	22
	Unk	9	0	7	9
Agon.	Init.	1	0	0	0
	Rec	0	3	0	0
	Unk	0	0	0	0
Other	Init	0	0	2	0
	Rec	1	0	0	0
	Unk	0	0	0	0



POV=OBN		BBBG2	OG	SHM	WC
Aff.	Init[1]	22	30	37	59
	Rec[1]	21	14	18	52
	Unk	4	3	7	9
Agon.	Init	0	5	0	3
	Rec	3	1	0	3
	Un.	0	0	0	0
Other	Init	0	0	0	9
	Rec	0	0	0	0
	Unk	0	0	0	0



POV=BBBG2		OBN	OG	SHM	WC
Aff.	Init[1]	16	29	60	29
	Rec[1]	9	44	43	15
	Unk	3	9	26	5
Agon.	Init	1	1	0	1
	Rec	0	0	0	0
	Un.	0	0	0	0
Other	Init	0	0	0	1
	Rec	0	0	0	0
	Unk	0	0	0	0



POV=WC		BBBG2	OBN	OG	SHM
Aff.	Init[1]	24	72	8	20
	Rec[1]	29	48	20	19
	Unk	8	16	2	4
Agon.	Init.	1	11	1	3
	Rec	1	6	0	0
	Unk	0	1	0	0
Other	Init	0	0	0	0
	Rec	0	6	0	0
	Unk	0	0	0	0

Key:

: Preferred direction of agonistic events (Agon.)

: Preferred direction of affiliative events (Aff.)

: Preferred direction of Other events (Other)

Init: Initiated by Focal, **Rec:** Received by Focal

Unk: Unknown initiator of event

POV: Point of view/Focal subject

[1]=Social unit (SU): $p<0.00$, df:3

Figure 1 shows the socio-grams for Caged female group during sessions when the male was not present. Of particular note are the varying strengths of the mother-daughter bonds and aggression being directed towards younger individuals.

Affiliative preferences

Mother-daughter dyad

OBN and WC: For the mother-daughter dyad with neither female nursing (WC and OBN), both mother and daughter showed a considerable preference for each other, in both cases more than double that of their second preferences. Overall, WC was the preferred partner of OBN (POV) in affiliative events, and this was seen from WC POV as well (SU: $p<0.000$, df: 3); OBN and WC directed more Affiliative events towards each other than towards any other single individual (both POVs, SU: $p<0.000$, df: 3), and they received significantly more Affiliative events from each other than any other subject (both POVs, SU: $p<0.000$, df: 3).

OG and BBBG2: Within the mother daughter dyad with only the mother (BBBG2) nursing, unlike the playground where both females were nursing, the daughter, OG (POV), showed a strong preference for her mother (Seen also from BBBG2 POV). OG (POV) directed more Affiliative events towards BBBG2 than towards any other single individual, however, she received more Affiliative events not from her mother but from OBN (a similarly aged female) than from any other subject.

Reproductive status

The nursing mother of OG, BBBG2 (POV) showed a slightly stronger preference for the other nursing female in the unit (SHM), BBBG2 (POV) directed significantly more Affiliative events towards SHM than towards other single individual (SU: $p<0.000$, df: 3), even though she received significantly more Affiliative events from OG, her daughter, than any other subject (SU: $p<0.000$, df: 3); although the large number of affiliative events involving SHM with a unknown initiator needs to be considered, supporting a potential reciprocal preference of SHM (from BBBG2 POV). From SHM (POV), BBBG2 was the preferred partner for Affiliative events (SU: p<0.000, df: 3), directing and receiving significantly more Affiliative events towards/from BBBG2 than any other single individual (initiated/received SU: p<0.000, df: 3).

Agonistic interactions: Towards a non nursing younger female

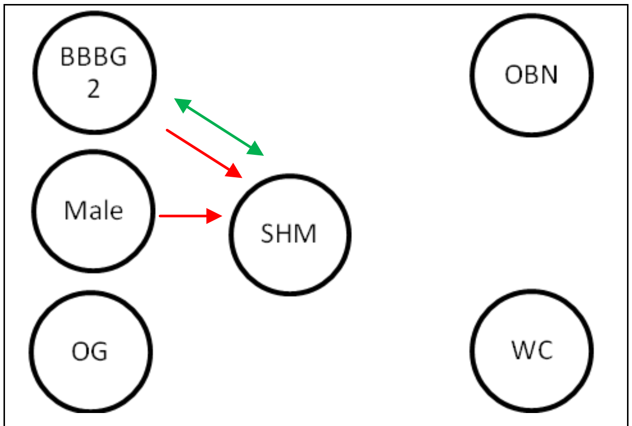
Looking at the agonistic data set from when the male was not present, we can see that all females directed their aggression towards the younger and non nursing females. BBBG2 (POV) was involved in 3 Agonistic events overall, all initiated by BBBG2 and directed towards OBN, OG and WC (all non nursing females). WC (POV) directed more Agonistic events towards OBN than towards other single individual, and received significantly more from OBN than from any other subject. SHM (POV) initiated and received more agonistic events from OBN (a non nursing female), while OBN (POV) also directed more events towards a non nursing female, OG, while receiving more agonistic events herself from WC and BBBG2 (Older females). OG (POV) directed more aggression towards SHM, but received more from BBBG2.

Other preference.

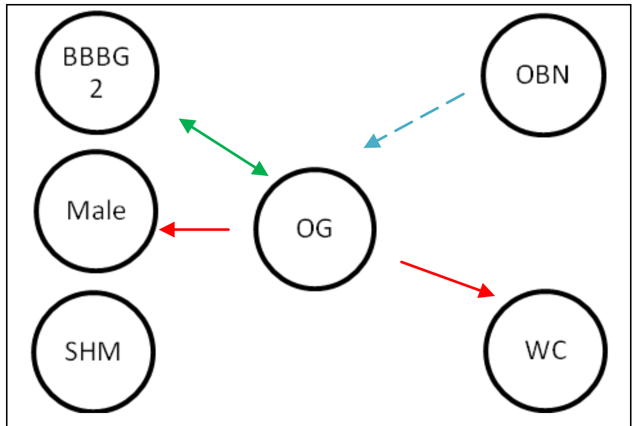
SHM (POV) was involved in 3 Other events overall, all initiated by her and directed towards BBBG2, OG and WC. OG (POV) was involved in 3 Other events overall, consisting of 2 events directed towards SHM and 1 event initiated by BBBG2. OBN (POV) directed the only recorded Other events for her (9 events) towards WC, while WC (POV) received the only recorded Other events (6 events) from OBN. BBBG2 (POV) also directed the only recorded other events towards WC.

Results section 2: Socio-grams for Caged females group

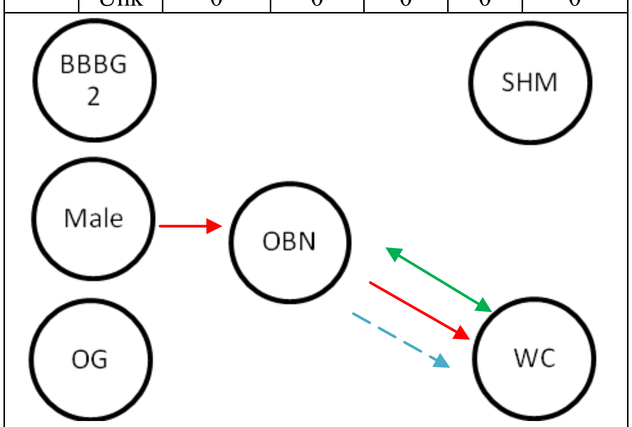
Figure 2: Socio-grams for the Caged female group during sessions with the introduced male.



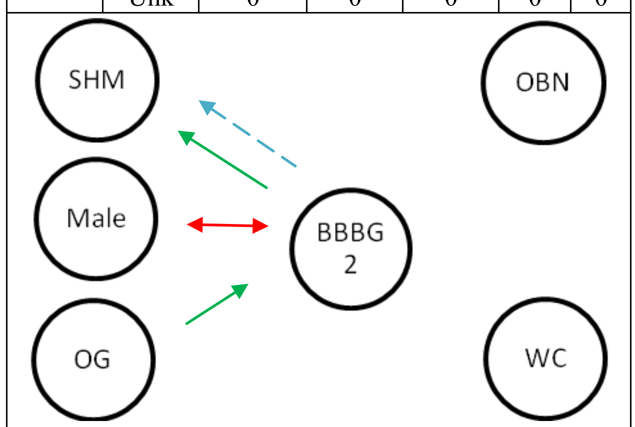
POV=SHM		BBBG 2	OBN	OG	WC	M
Aff.	Init	7	1	3	2	3
	Rec	10	3	6	2	1
	Unk	5	0	1	0	0
Agon.	Init.	0	0	0	0	0
	Rec	1	0	0	0	1
	Unk	1	0	0	0	0
Other	Init	0	0	0	0	0
	Rec	0	0	0	0	0
	Unk	0	0	0	0	0



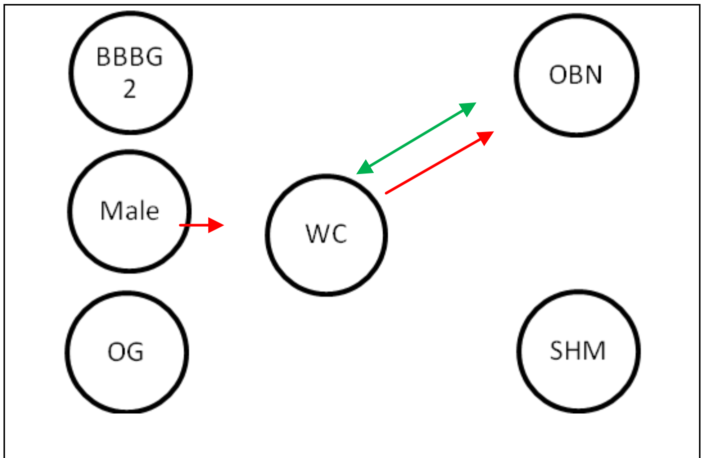
POV=OG		BBBG 2	OBN	SHM	WC	M
Aff.	Init[1/2]	47	11	24	29	2
	Rec	24	11	20	11	5
	Unk	8	0	3	3	3
Agon.	Init.	0	0	0	1	1
	Rec	0	0	0	0	7
	Unk	0	0	0	0	0
Other	Init	0	0	0	0	0
	Rec	0	0	0	0	0
	Unk	0	0	0	0	0



POV=OBN		BBBG 2	OG	SHM	WC	M
Aff.	Init[1/2]	7	8	3	24	5
	Rec[1/2]	2	2	3	15	3
	Unk	5	2	4	13	1
Agon.	Init.	0	0	0	5	2
	Rec	0	0	0	2	10
	Unk	0	0	0	0	0
Other	Init	0	0	0	0	0
	Rec	0	0	0	0	0
	Unk	0	0	0	0	0



POV=BBBG 2		OBN	OG	SHM	WC	M
Aff.	Init[1]	8	6	25	8	1
	Rec[1]	12	16	13	7	4
	Unk	4	9	12	10	0
Agon.	Init.	0	0	0	0	2
	Rec	0	0	0	0	1
	Unk	0	0	0	0	1
Other	Init	0	0	1	0	0
	Rec	0	0	0	0	0
	Unk	0	0	0	0	0



POV=WC		BBBG2	OBN	OG	SHM	M
Aff.	Init[1/2]	6	24	5	17	8
	Rec[1/2]	8	29	6	16	10
	Unk	1	11	3	8	6
Agon.	Init.	0	1	0	0	0
	Rec	0	0	0	0	5
	Unk	0	0	0	0	0
Other	Init	0	0	0	0	0
	Rec	0	0	0	0	0
	Unk	0	0	0	0	0

Key:

: Preferred direction of agonistic events (Agon.)

: Preferred direction of affiliative events (Aff.)

: Preferred direction of Other events (Other)

M: Male

Init: Initiated by Focal, **Rec:** Received by Focal

Unk: Unknown initiator of event

POV: Point of view/Focal subject

[1]=Social unit (SU)+ Male: $p<0.00$, df:4, [2]= Social unit(SU): $p<0.000$, df: 3

Figure 1 show the socio-grams for Caged female group during sessions when the male was present. With the male present, Mother-Daughter bonds were still strongly influencing the affiliative interaction patterns and aggression was still being directed towards younger individuals. The affiliative relationship between the mother and daughter were also coupled with a strong agonistic relationship (see relevant data tables).

Affiliative preferences

Mother-daughter dyad

OBN and WC: Overall, irrespective of direction of the Behavioural events, OBN and WC (both POV, Mother and Daughter) were each other's preferred partner in Affiliative events (SU+male: $p<0.000$, df: 4, SU: $p<0.000$, df: 3). OBN and WC (both POV) directed more Affiliative events towards each other than towards any other single individual (SU+male $p<0.000$, df: 4, SU: $p<0.000$, df: 3), and also received significantly more Affiliative events from each other than from any other subject (SU+male: $p<0.000$, df: 4, SU: $p<0.000$, df: 3).

OG and BBBG2: OG (POV) directed more Affiliative events towards BBBG2 than towards other single individual (SU+male: $p<0.000$, df: 4, SU: $p<0.000$, df: 3), and she also received more from BBBG2 than from any other subject, even though from BBBG2 POV this was not the case.

Reproductive status

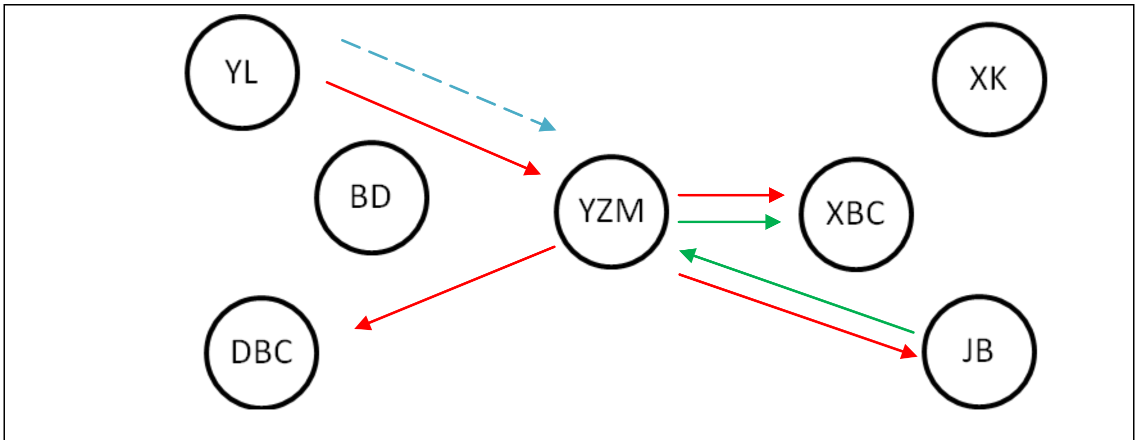
The two nursing females continued to show a preference for each other. While BBBG2 (POV) received more Affiliative events from OG than any from other subject (SU: $p<0.000$, df: 4), BBBG2 directed significantly more Affiliative events towards SHM than towards any other single individual (SU+male: $p<0.000$, df: 4), although, as in the sessions without the male, there are a large number of affiliative events (this time, spread across a number of subjects) with an unknown initiator recorded for her. SHM (POV) directed more Affiliative events towards BBBG2 (the other nursing female) than towards any other single individual and she also received more Affiliative events from BBBG2 than from any other subject.

Agonistic interactions: Towards a non nursing younger female and involving the male.

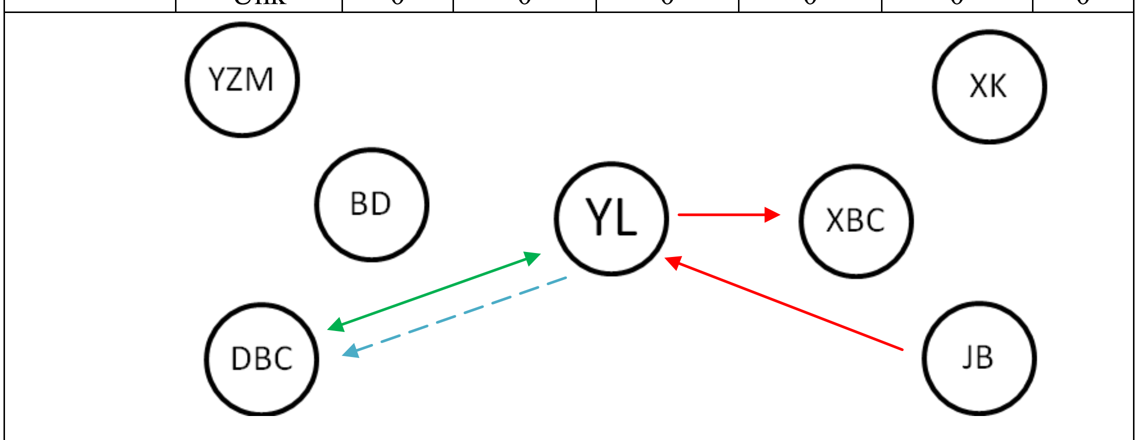
For agonistic data with the male present, non nursing females were the most common partners in agonistic interactions. OBN (POV) directed more Agonistic events towards WC than towards any other single individual, and received more from the male, followed by WC, than from any other individual. WC (POV) was involved in 6 Agonistic events, consisting of 1 directed towards OBN and 5 received from the male. SHM (POV) received more aggression from the male and BBBG2. BBBG2's (POV) agonistic data set all involved the male as well. OG and OBN (both POV) similarly received the majority of their agonistic events from the newly introduced male, while OBN (POV) directed more towards WC than any other subject.

Results Section 2: Socio-grams for JB unit.

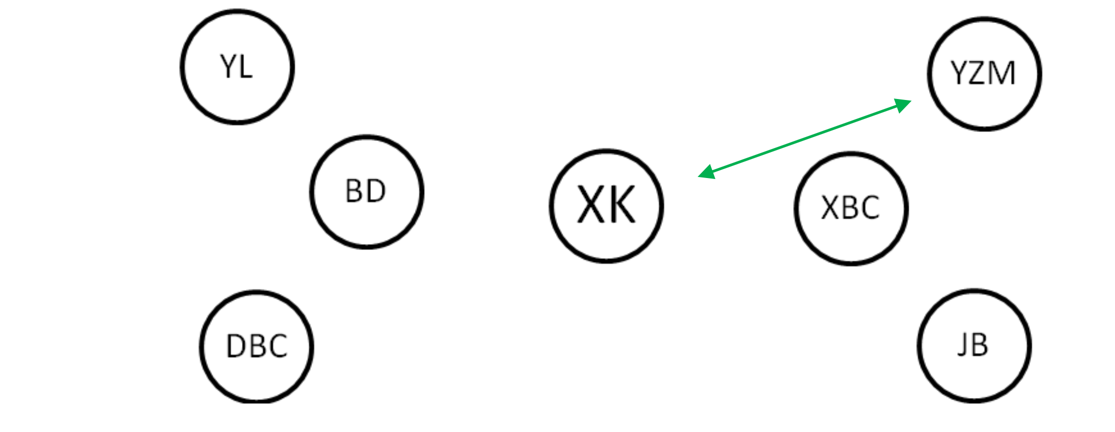
Figure 1: Socio-grams for the JB unit before the birth season



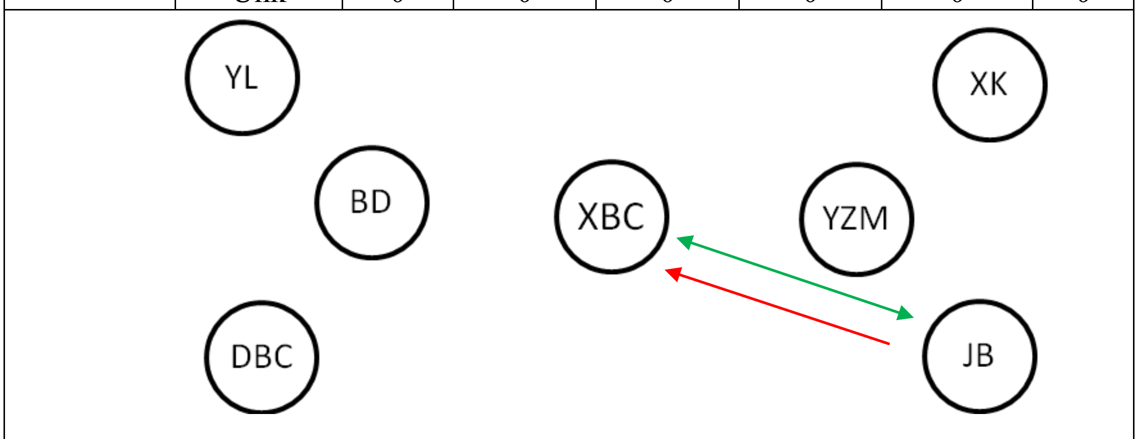
POV=YZM		BD	JB	XBC	DBC	YL	XK
Aff.	Init	5	1	14	0	0	12
	Rec	0	12	7	1	4	4
	Unk	0	2	9	1	1	14
Agon.	Init.	0	1	1	1	0	0
	Rec	1	2	0	0	3	0
	Unk	0	0	0	0	0	0
Other	Init	0	0	0	0	0	0
	Rec	0	1	0	1	2	0
	Unk	0	0	0	0	0	0



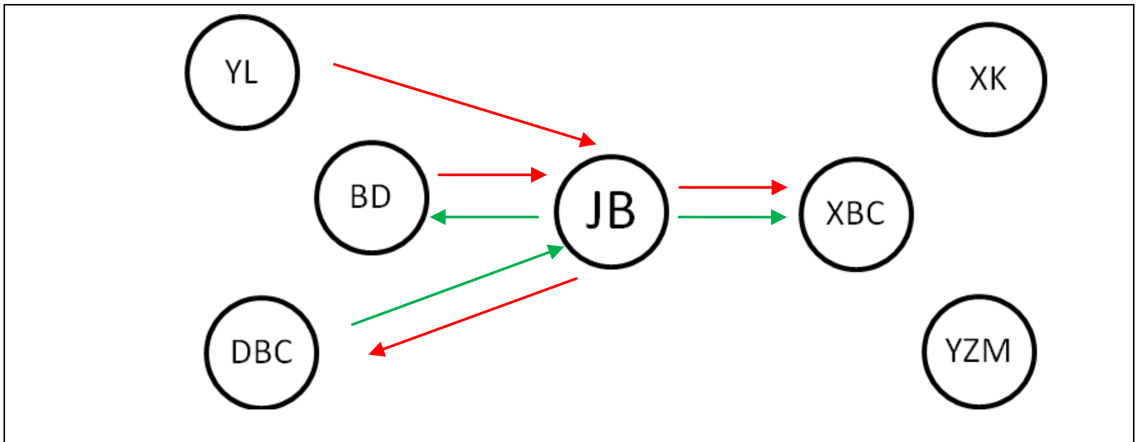
POV=YL		BD	JB	XBC	DBC	YZM	XK
Aff.	Init	3	10	1	11	3	1
	Rec	0	3	1	9	1	0
	Unk	1	3	0	5	1	1
Agon.	Init.	0	0	2	0	0	0
	Rec	0	1	0	0	0	0
	Unk	0	0	0	0	0	0
Other	Init	0	0	0	1	0	0
	Rec	0	0	0	0	0	0
	Unk	0	0	0	0	0	0



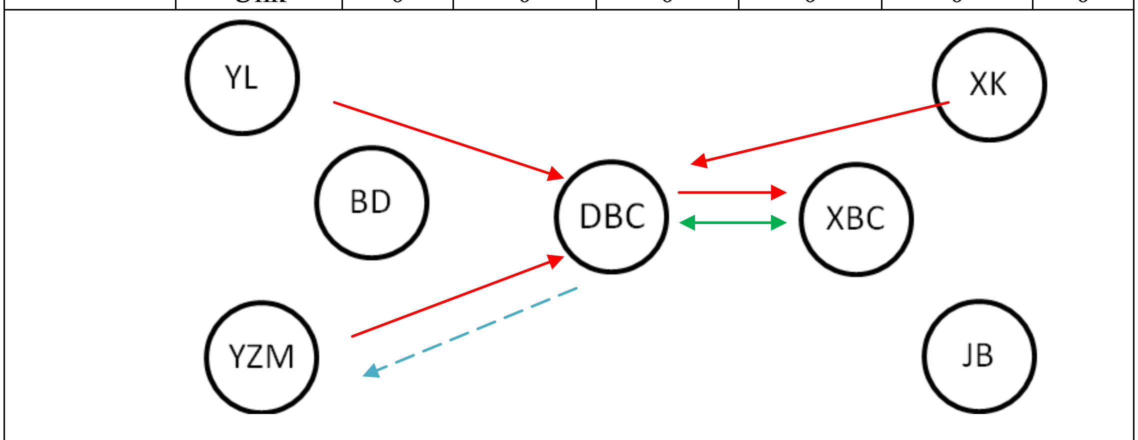
POV=XK		BD	JB	XBC	DBC	YZM	YL
Aff.	Init	2	8	4	2	10	0
	Rec	0	1	2	1	7	0
	Unk	0	1	2	0	5	1
Agon.	Init.	0	0	0	0	0	0
	Rec	0	0	0	0	0	0
	Unk	0	0	0	0	0	0
Other	Init	0	0	0	0	0	0
	Rec	0	0	0	0	0	0
	Unk	0	0	0	0	0	0



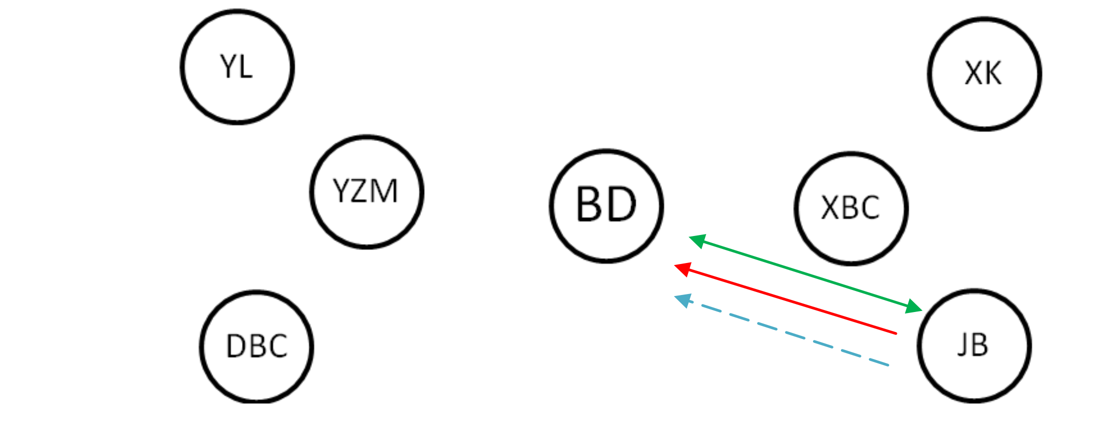
POV=XBC		BD	JB	DBC	XK	YZM	YL
Aff.	Init	0	5	1	2	1	1
	Rec	0	2	1	0	1	0
	Unk	0	1	0	0	0	0
Agon.	Init.	0	0	0	0	0	0
	Rec	0	1	0	0	0	0
	Unk	0	0	0	0	0	0
Other	Init	0	0	0	0	0	0
	Rec	0	0	0	0	0	0
	Unk	0	0	0	0	0	0



POV=JB		BD	XBC	DBC	XK	YZM	YL
Aff.	Init	9	9	8	0	5	2
	Rec	5	1	9	0	2	2
	Unk	2	2	5	0	1	3
Agon.	Init.	0	1	1	0	0	0
	Rec	1	0	0	0	0	1
	Unk	0	0	0	0	0	0
Other	Init	0	0	0	0	0	0
	Rec	0	0	0	0	0	0
	Unk	0	0	0	0	0	0



POV=DBC		BD	JB	XBC	XK	YZM	YL
Aff.	Init	1	6	13	8	7	2
	Rec	3	8	8	3	1	4
	Unk	1	1	6	4	4	3
Agon.	Init.	0	0	1	0	0	0
	Rec	1	0	0	1	1	1
	Unk	0	0	0	0	0	0
Other	Init	0	0	0	0	2	0
	Rec	0	0	0	0	0	0
	Unk	0	0	0	0	0	0



POV=BD		JB	XBC	DBC	XK	YZM	YL
Aff.	Init	13	3	1	0	5	0
	Rec[1]	15	10	3	0	3	1
	Unk	9	4	1	0	4	1
Agon.	Init.	0	0	0	0	0	0
	Rec	1	0	0	0	0	0
	Unk	0	0	0	0	0	0
Other	Init	0	0	0	0	0	0
	Rec	1	0	0	0	0	0
	Unk	0	0	0	0	0	0

Key:

: Preferred direction of agonistic events (Agon.)

: Preferred direction of affiliative events (Aff.)

: Preferred direction of Other events (Other)

Init: Initiated by Focal, **Rec:** Received by Focal

POV: Point of view/Focal subject

[1]=Social unit(SU): $p<0.00$, df:4

Figure 1 shows the socio-grams for JB unit before the birth season in April. Of particular note are the varying strengths of the mother-daughter bonds. One thing that needs to be considered is that these tables do not include data collected when the individual involved with the Focal could not be identified (see attached appendix).

Affiliative preferences:

Mother daughter bond

YL and DBC: The mother (YL POV) showed a strong affiliative relationship with the DBC. Overall, for YL (POV), irrespective of direction of the affiliative events, DBC (her daughter) was the preferred partner in Affiliative events (SU: $p<0.000$, df: 5, SUF: $p<0.000$, df: 4), a preference seen in events both initiated and received by YL (POV).

XK and XBC: The Mother-daughter dyad XK(nursing mother) and XBC (non nursing subadult) showed a partial affiliative preference for each other expressed predominantly from the subadult point of view; Affiliative events initiated by XBC (POV) showed a preference for the male overall, but among the females, XK(her nursing mother). Affiliative events received by DBC (POV) were from XBC and YZM, and JB the unit male.

Reproductive status

For XK (POV), the nursing mother of XBC, irrespective of direction of the affiliative events, the nursing female YZM was the preferred partner in Affiliative events (SU: $p<0.000$, df: 5, SUF: $p<0.000$, df: 4). Affiliative events initiated by XK(POV) had a preference for YZM, and in the affiliative events received by XK there was a greater representation of YZM over other individuals present. YZM (POV) directed more Affiliative events towards XBC than towards any other individual. YZM received more Affiliative events from JB male, followed by XK and YL, than from any other subject. It should be noted that a large number of affiliative events were recorded involving XK but without an identifiable initiator.

Age related

DBC (POV) did not show a strong attraction towards her mother, instead directing affiliative interactions predominantly towards XBC, a similar aged and non nursing subadult. Overall, for DBC (POV) irrespective of direction of the Behavioural events, XBC was the preferred partner in Affiliative events (SUF: $p<0.000$, df: 4, SUF: $p<0.001$, df: 5). DBC directed more Affiliative events towards XBC than any other individual. DBC (POV) also received significantly more Affiliative events from XBC (in equal amounts to JB see below). DBC and XBC were also not nursing, so shared a similar reproductive status.

Male preference for younger and non nursing individuals

For the male, preference can be seen for the younger and non nursing subadults and females. JB (POV) directed more Affiliative events towards XBC and BD, and received more from DBC than from any other subject, while DBC(POV) also received significantly more Affiliative events from XBC and JB (in equal amounts to XBC see above). From BD POV, BD directed more Affiliative events towards JB than towards any other single individual. BD (POV) received significantly more Affiliative events from JB (SU: $p<0.000$, df: 4).

Agonistic preference

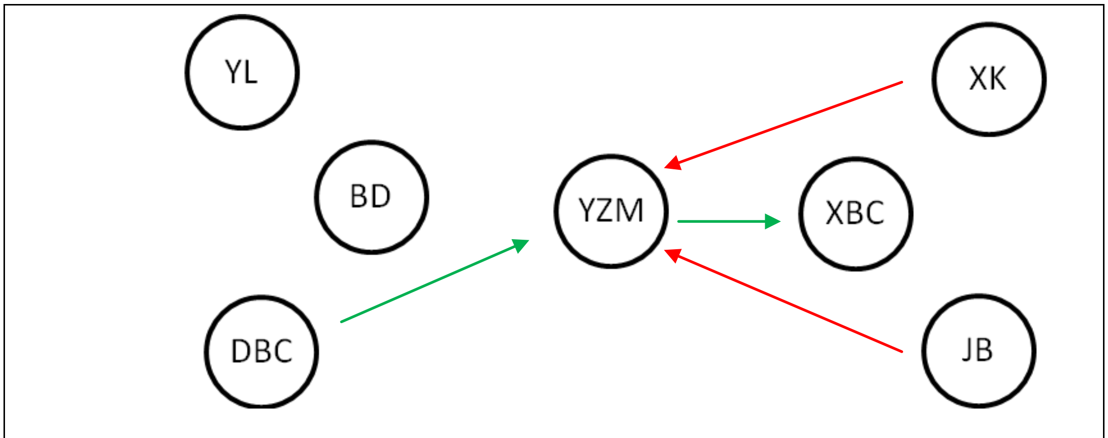
Aggression was predominantly directed towards younger subadult females without infants. YL (POV) directed agonistic events towards XBC (a subadult), and received them from JB. XBC (POV) was involved in only 1 Agonistic event, received from JB. XBC did not initiate any Agonistic events. JB male (POV) directed one Agonistic event towards XBC and DBC (subadults), and received 1 from BD and YL (adult females) each. DBC (POV) directed a single Agonistic event towards XBC, and received 4, one each from BD, XK, YZM, YL each. BD (POV) was involved in 1 Agonistic event, received from JB. YZM (POV) directed 1 Agonistic event to JB, XBC and DBC each. YZM (POV) received more Agonistic events from YL.

Other preference

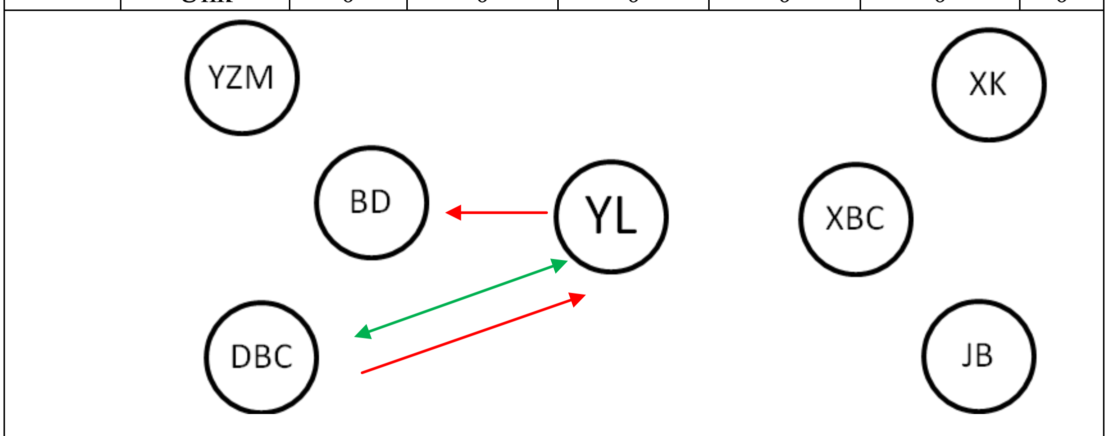
YL (POV) was involved in 1 Other event, directed towards DBC. DBC (POV) initiated 2 Other events, both towards YZM. BD (POV) was involved in 1 Other event received from JB male. YZM (POV) was involved in 4 Other events. YZM (POV) received 1 more Other event from YL than from any other individual.

Results Section 2: Socio-grams for JB unit

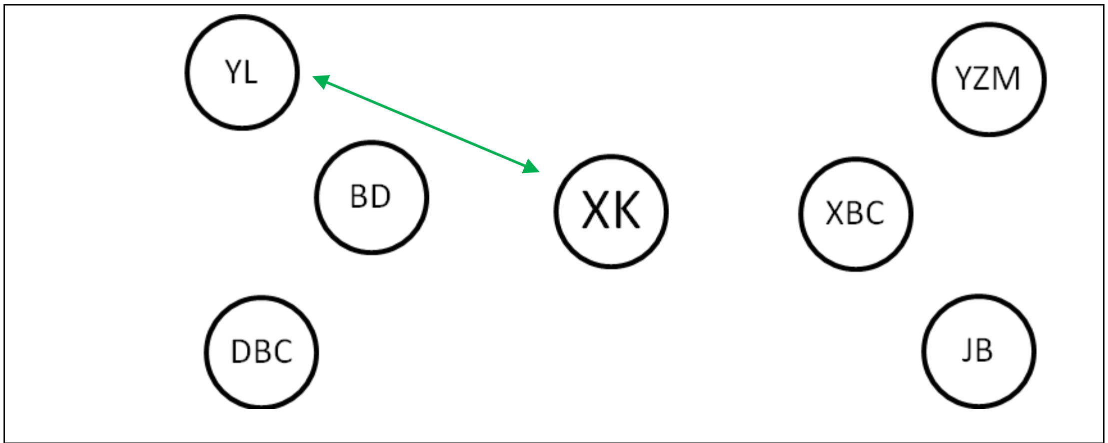
Figure 2: Socio-grams for the JB unit after the birth season



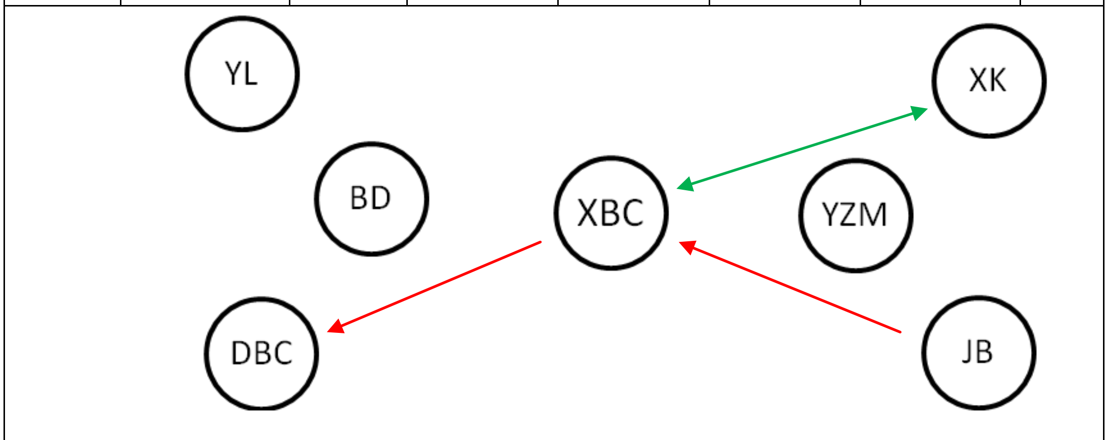
POV=YZM		BD	JB	XBC	DBC	YL	XK
Aff.	Init$^{3/4}$	0	2	20	3	15	6
	Rec$^{3/4}$	3	3	8	18	5	4
	Unk	1	0	6	2	10	6
Agon.	Init.	0	0	0	0	0	0
	Rec	0	1	0	0	0	1
	Unk	0	0	0	0	0	0
Other	Init	0	0	0	0	0	0
	Rec	0	0	0	0	0	0
	Unk	0	0	0	0	0	0



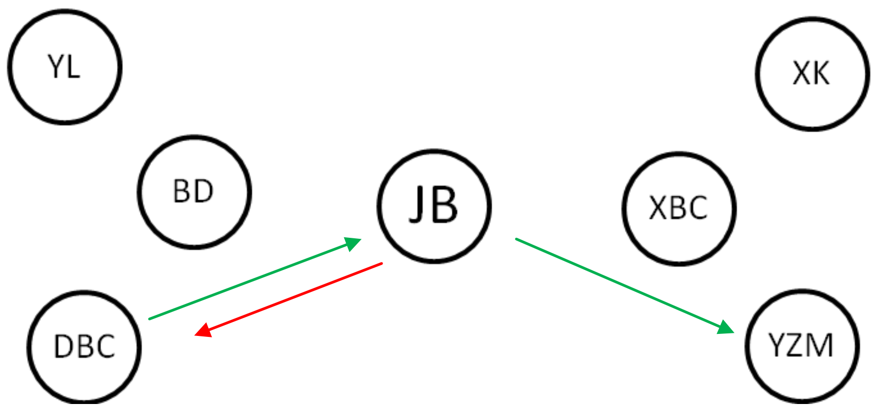
POV=YL		BD	JB	XBC	DBC	YZM	XK
Aff.	Init$^{1/2}$	1	1	5	20	5	3
	Rec$^{1/2}$	6	5	9	29	5	4
	Unk	2	2	4	20	4	2
Agon.	Init.	1	0	0	0	0	0
	Rec	0	0	0	1	0	0
	Unk	0	0	0	0	0	0
Other	Init	0	0	0	0	0	0
	Rec	0	0	0	0	0	0
	Unk	0	0	0	0	0	0



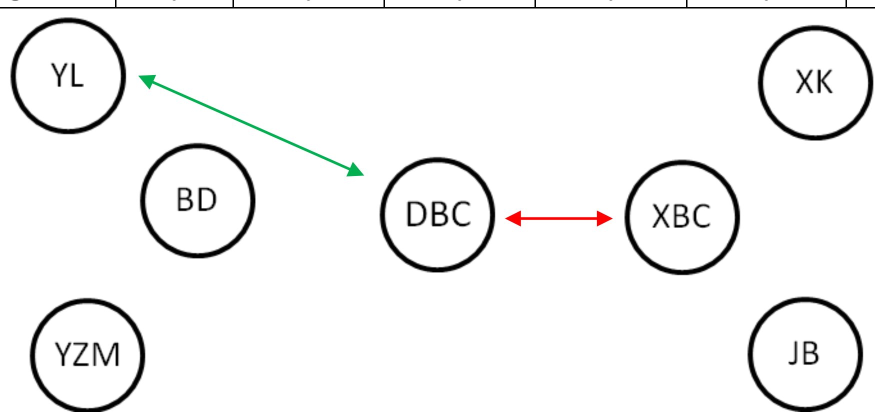
POV=XK		BD	JB	XBC	DBC	YZM	YL
Aff.	Init$^{1/2}$	2	1	5	1	2	12
	Rec$^{1/2}$	0	0	3	2	2	6
	Unk	1	1	1	0	1	11
Agon.	Init.	0	0	0	0	0	0
	Rec	0	0	0	0	0	0
	Unk	0	0	0	0	0	0
Other	Init	0	0	0	0	0	0
	Rec	0	0	0	0	0	0
	Unk	0	0	0	0	0	0



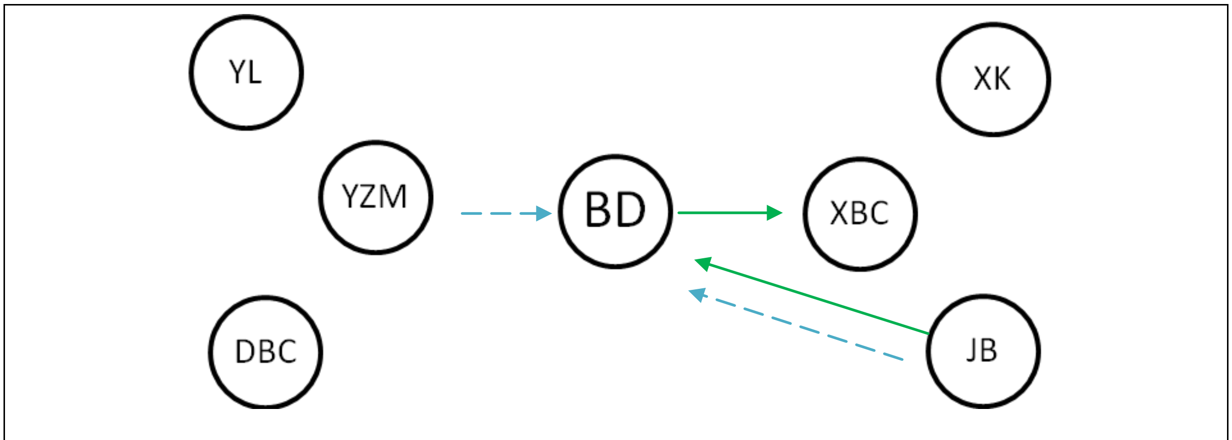
POV=XBC		BD	JB	DBC	XK	YZM	YL
Aff.	Init	0	1	7	8	7	1
	Rec$^{1/4}$	1	1	7	18	8	0
	Unk	0	0	2	6	3	0
Agon.	Init.	0	0	1	0	0	0
	Rec	0	1	0	0	0	0
	Unk	0	0	0	0	0	0
Other	Init	0	0	0	0	0	0
	Rec	0	0	0	0	0	0
	Unk	0	0	0	0	0	0



POV=JB		BD	XBC	DBC	XK	YZM	YL
Aff.	Init	3	4	11	3	12	1
	Rec	7	5	14	6	5	1
	Unk	7	0	4	1	3	0
Agon.	Init.	0	1	2	0	0	0
	Rec	0	0	0	0	0	0
	Unk	0	0	0	0	0	0
Other	Init	0	0	0	0	0	0
	Rec	0	0	0	0	0	0
	Unk	0	0	0	0	0	0



POV=DBC		BD	JB	XBC	XK	YZM	YL
Aff.	Init[2/6]	6	1	13	3	0	36
	Rec[1/2]	7	8	9	2	4	27
	Unk	0	1	5	0	0	32
Agon.	Init.	1	0	2	0	0	1
	Rec	0	0	2	0	0	0
	Unk	0	0	0	0	0	0
Other	Init	0	0	0	0	0	0
	Rec	0	0	0	0	0	0
	Unk	0	0	0	0	0	0



POV=BD		JB	XBC	DBC	XK	YZM	YL
Aff.	Init[2/5]	16	17	0	0	5	2
	Rec[1]	19	10	3	1	4	3
	Unk	7	8	2	1	6	3
Agon.	Init.	0	0	0	0	0	0
	Rec	0	0	0	0	0	0
	Unk	0	0	0	0	0	0
Other	Init	0	0	0	0	0	0
	Rec	2	0	0	0	2	0
	Unk	0	0	0	0	0	0

Key:

: Preferred direction of agonistic events (Agon.)

: Preferred direction of affiliative events (Aff.)

: Preferred direction of Other events (Other)

Init: Initiated by Focal, **Rec:** Received by Focal

POV: Point of view/Focal subject

[1]=Social unit (SU): $p<0.000$, df:5, [2]= Social unit females (SUF): $p<0.000$, df: 4,

[3] =Social unit (SU): $p<0.001$, df: 4, [4]= Social unit females (SUF): $p<0.001$, df:3,

[5]= Social unit females (SUF): $p<0.001$, df:5, [6]= Social unit (SU): $p<0.000$, df:4

Figure 2 shows the socio-grams for JB unit after the birth season in April. Of particular note are the changes in preferences that correspond with changing age and reproductive status of some of the subjects. One thing that needs to be considered is that these tables do not include data collected when the individual involved with the focal could not be identified (see attached appendix).

Affiliative preferences:

Mother daughter bond

YL and DBC: After the birth season in April, YL and DBC showed a stronger mother-daughter bond, now that YL was nursing, seen from both the mother and the daughter POVs. Affiliative events initiated and received by YL (POV) showed a significant preference for DBC, her daughter (Initiated/received SU: $p<0.000$, df: 5, SUF: $p<0.000$, df: 4). DBC (POV) directed more Affiliative events towards YL (SU: $p<0.000$, df: 4, SUF: $p<0.000$, df: 4) and she also received significantly more Affiliative events from YL than from any other subject (SU: $p<0.000$, df: 5, SUF: $p<0.000$, df: 4).

XK and XBC: XBC (POV), now nursing, showed a stronger preference for her mother, Overall, irrespective of direction, XK (her mother) was the preferred partner in Affiliative events (SU: $p<0.000$, df:5, SUF: $p<0.000$, df:4). Affiliative events initiated and received by XBC (POV) showed a preference for XK (received SU: $p<0.000$, df: 5, SUF: $p<0.001$, df:3).

Reproductive status

XK (POV) the mother of XBC exhibited a preference for YL, who was also nursing, for affiliative interaction. Affiliative events initiated and received by XK (POV) showed a preference for YL (initiated and received SU: $p<0.000$, df: 5, SUF: $p<0.000$, df: 4).

YZM (POV), even though no longer technically nursing, showed a preference for a nursing female, directing more affiliative events towards XBC than any other individual (SU:

$p<0.000$, df: 4, SUF: $p<0.001$, df: 3), whilst receiving more affiliative events from another non nursing female, DBC (SU: $p<0.000$, df: 4, $p<0.001$, df: 3).

Male preference for younger and non nursing individuals

The male's preference was for younger and non nursing females, similar to before the birth season. Overall for JB (POV), irrespective of direction of the behavioural events, DBC (Non nursing) was the preferred partner in Affiliative events (Affiliative: SU: $p<0.000$, df: 5), even though JB male (POV) directed more Affiliative events towards YZM, followed by DBC, and he received more from DBC than from any other subject. From BD POV, Overall, irrespective of direction of the behavioural events, JB (SU: $p<0.000$, df: 5) was the preferred partner in Affiliative events. Although BD (POV) directed more Affiliative events towards XBC (SUF: $p<0.000$, df: 4, SU: $p<0.001$, df: 5), she received significantly more from JB (SU) than any other subject (SU: $p<0.000$, df: 5), followed by XBC (SUF).

Agonistic preferences

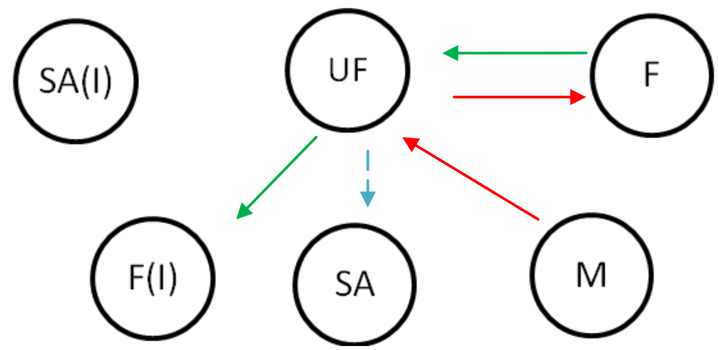
There were too few agonistic interactions after the birth season to discern any real patterns of interaction, although non nursing and young females were still common recipients. YL (POV) was involved in 2 Agonistic events, 1 directed towards BD and 1 received from DBC. XBC (POV) was involved in 2 Agonistic events, one initiated by XBC and directed towards DBC and one received from JB. JB (POV) was involved in only 3 Agonistic events, all initiated by him and the majority directed towards DBC. XBC received more Agonistic events from DBC (POV) than any other individual and XBC was the only individual from whom DBC (POV) received Agonistic events. YZM (POV) received 2 Agonistic events, one from JB and one from XK.

Other preferences

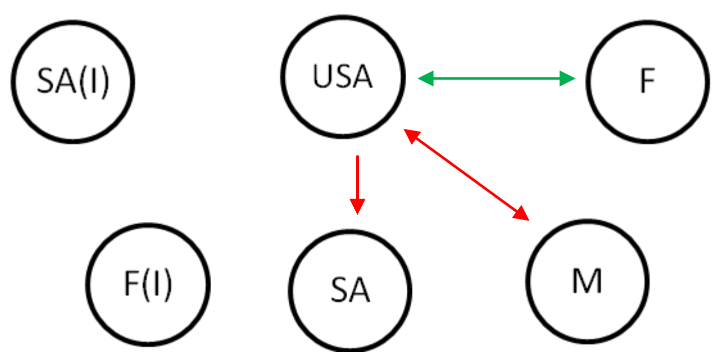
BD (POV) was involved in 4 Other events during this period, two each received from JB and YZM.

Results section 2: Socio-grams for the unidentified individuals of West Ridge Troop.

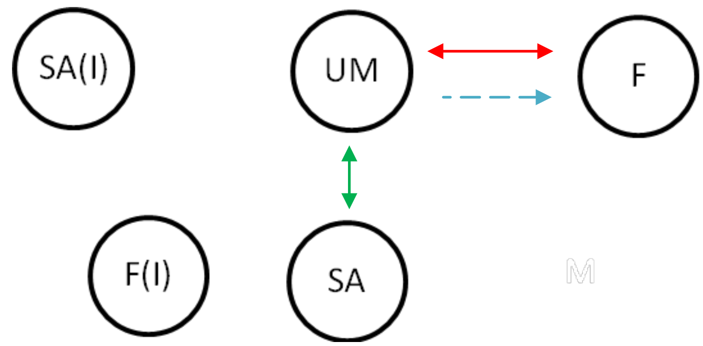
Figure 1: Socio-grams for the unidentified individuals of the WRT.



POV= unidentified Female		FEMALE	FEMALE(IMMATURE)	MALE	SA	SA(IMMATURE)
Aff.	Init[3/4/5/6]	132	173	47	56	5
	Rec[3/4/5/6]	123	88	65	75	23
	Unk	59	97	27	48	11
Agon.	Init.	2	0	1	1	0
	Rec	2	0	12	0	0
	Unk	0	0	0	0	0
Other	Init	0	0	0	1	0
	Rec	0	0	0	0	0
	Unk	0	0	0	0	0



POV= unidentified SA		FEMALE	FEMALE(IMMATURE)	MALE	SA	SA(IMMATURE)
Aff.	Init[1/3/8/10]	86	36	15	6	0
	Rec[1/5/6/9]	52	14	18	4	0
	Unk	45	26	7	3	0
Agon.	Init.	0	0	1	1	0
	Rec	2	0	5	0	0
	Unk	0	0	0	0	0
Other	Init	0	0	0	0	0
	Rec	0	0	0	0	0
	Unk	0	0	0	0	0



POV=unidentified Male		FEMALE	FEMALE(IMMATURE)	SA	SA(IMMATURE)
Aff.	Init[1/2]	156	66	17	1
	Rec[1/2]	111	55	25	7
	Unk	74	27	10	2
Agon.	Init[6/9]	29	2	3	0
	Rec	3	0	0	0
	Unk	0	0	2	0
Other	Init	6	2	1	0
	Rec	0	0	0	0
	Unk	0	0	0	0

Key:

: Preferred direction of agonistic events (Agon.)

: Preferred direction of affiliative events (Aff.)

: Preferred direction of Other events (Other)

Init: Initiated by Focal, **Rec:** Received by Focal

POV: Point of view/Focal subject

[1]=SU1: $p<0.000$, df:3, [2]= SU1: $p<0.000$, df: 1, [3]=SU2: $p<0.000$, df:2, [4]= SU1: $p<0.000$, df: 4, [5]=SUF1: $p<0.000$, df:3, [6]= SUF2: $p<0.000$, df: 1, [7]=SUF2: $p<0.000$, df:2, [8]= SUF2: $p<0.000$, df: 1, [9]= SUF2: $p<0.000$, df: 2, [10]= SUF1: $p<0.000$, df: 2

SU1: Social unit with females/subadults divided into holding immatures (F (immatures) and SA (immatures)) and not holding immatures

SU2: Social unit without females/subadults divided into holding immatures (F (immatures) and SA (immatures)) and not holding immatures

SUF1: Social unit with females/subadults divided into holding immatures (F (immatures) and SA (immatures)) and not holding immatures but without male

SUF2: Social unit without females/subadults divided into holding immatures (F (immatures) and SA (immatures)) and not holding immatures

Figure 1 shows the socio-grams for unidentified individuals within the Western Ridge Troop (WRT). This is based on data collected from individuals who were only identified to the level of Age/Sex class and whether or not they were carrying an immature at the time of identification. One thing that needs to be considered is that these tables do not include data collected when the individual involved with the Focal could not be identified (see attached appendix).

Affiliative preferences:

Affiliative events initiated by UF (POV) showed a preference for females with immatures (SU1: $p<0.000$, df:4, SU2: $p<0.000$, df:2, SUF1: $p<0.000$, df: 3, SUF2: $p<0.000$, df: 1). Affiliative events were received by UF (POV) showed a greater representation of females without immatures over other individuals present (SU1: $p<0.000$, df:4, SU2: $p<0.000$, df:2, SUF1: $p<0.000$, df: 3, SUF2: $p<0.000$, df: 1).

Affiliative events initiated by USA (POV) showed a preference for females, in particular those without immatures (SU1: $p<0.000$, df:3, SU2: $p<0.000$, df:2, SUF1: $p<0.000$, df: 2, SUF2: $p<0.000$, df: 1). Affiliative events received by USA (POV) exhibited a greater representation of females without immatures over other individuals present (SU1: $p<0.000$, df:3, SU2: $p<0.000$, df:2, SUF1: $p<0.000$, df: 3, SUF2: $p<0.000$, df: 1).

Affiliative events initiated by UM (POV) with a preference for females, in particular those without immatures (SU1: $p<0.000$, df: 3, SU2: $p<0.000$, df: 1). Affiliative events received by UM (POV) showed a greater representation of females without immatures over other individuals present (SU1: $p<0.000$, df:3, SU2: $p<0.000$, df:1).

Agonistic preferences:

Agonistic events initiated by UF (POV) showed a preference for females, in particular those with immatures. Agonistic events received by UF (POV) portrayed a greater representation of the Male followed by females, in particular those without immatures over other individuals present.

Agonistic events initiated by USA (POV) were towards other SA and males. Agonistic events received by USA (POV), were predominantly from males.

Agonistic events initiated by UM (POV) showed a preference for females, in particular those without immatures (SU1: $p<0.000$, df: 2, SU2: $p<0.000$, df: 1). 3 Agonistic events were received by UM (POV), all from females without immatures.

Other preferences

Females without immatures were the most common recipient of Other events initiated by UM (POV).

UF (POV) were involved in 1 Other event, initiated by UF, directed towards a subadult.

Results section 3: Preferred interaction partners based on prevalence across behavioural event types for Playground group.

Table 1: Preferred interaction partners by behavioural event type (before the removal of NSF).

Focal Animal	Event Category	Initiated		Received		Overall	
		SU	**SUF**	**SU**	**SUF**	**SU**	**SUF**
BBBG	**Glance**	OMU/SF	SF				
	Stare	NSF	NSF				
	Affiliative partnership preference	OMU	SF/BBSG	BBSG/OMU/SF	BBSG	BBSG	BBSG/SF
	Agonistic partnership preference	NSF/SF	NSF/SF	BBSG	BBSG	BBSG	BBSG
	Other partnership preference			BBSG	BBSG	BBSG	BBSG
	Self Groom	18					
OMU	**Glance**	SF					
	Stare	SF					
	Copulation	SF/BBSG					
	Affiliative partnership preference	SF		BBSG		BBSG/SF	
	Agonistic partnership preference	SF		SF		SF	
	Other partnership preference						
	Self Groom			BBSG		BBSG	

Focal Animal	**Event Category**	**Initiated**		**Received**		**Overall**	
		SU	**SUF**	**SU**	**SUF**	**SU**	**SUF**
NSF	**Glance**	SF					
	Stare	OMU	BBBG				
	Copulation			1			
	Affiliative partnership preference	OMU/BBSG	BBSG	BBSG	BBSG	BBSG	BBSG
	Agonistic partnership preference	BBBG	BBBG	BBSG	BBSG	BBSG/SF	BBSG/SF
	Other partnership preference			BBSG	BBSG	BBSG	BBSG
	Self Groom	35					
BBSG	**Glance**	OMU	SF				
	Stare	OMU/ SF	SF				
	Copulation			5			
	Affiliative partnership preference	SF/NSF	SF/NSF	OMU	SF	OMU	SF
	Agonistic partnership preference	SF	SF	OMU		SF	SF
	Other partnership preference	OMU	BBBG			OMU	BBBG/NSF
	Self Groom	32					

Focal Animal	Event Category	Initiated		Received		Overall	
		SU	**SUF**	**SU**	**SUF**	**SU**	**SUF**
SF	**Glance**	OMU	NSF				
	Stare	OMU					
	Copulation			1			
	Affiliative partnership preference	BBSG	BBSG	BBSG	BBSG	BBSG	BBSG
	Agonistic partnership preference	BBBG	BBBG	BBSG	BBSG	BBSG	BBSG
	Other partnership preference			BBSG	BBSG	BBSG	BBSG
	Self Groom	6					

Table 1 shows the summarized results for preferred interaction partners (initiated, received and events with unknown initiator) for each of the Behavioural events documented in this study. For breakdown per event type, see appendix 3 (as with subsequent data for other analysis and other groups at this level).These were categorised as Affiliative, Agonistic or Other and the most common individual represented as the preferred partner is shown above. Even though Glances were undefined in the literature as being affiliative or agonistic, in some cases (and in the groups where Glance data were collected) the data collected on this behavioural event seemed to follow the affiliative preferences

Affiliative preferences:

Mother-daughter dyad:

BBSG and SF: BBSG (POV) was involved in 7 Affiliative event types and showed a preference for SF as a partner. She initiated more Affiliative event types to SF and NSF (both nursing: Reproductive status), and received more from OMU, and SF among the females. In particular, she directed significantly more Proximity events towards SF (SU: $p<0.001$, df: 3, SUF: $p<0.001$, df: 2), whilst receiving significantly more from OMU, followed by SF (SU: $p<0.000$, df: 3, SUF: $p<0.000$, df: 2). BBSG (POV) also directed significantly more Glances towards her daughter SF (SU: $p<0.000$, df: 3, SUF: $p<0.000$, df: 2), though surprisingly the lowest number was towards the other nursing female: NSF. SF (POV) was involved in 7 Affiliative event types and showed a preference for BBSG as a partner; she initiated and received more Affiliative event types towards/from BBSG. SF (POV) directed and received significantly more events towards/from BBSG in terms of Single groom events (Initiated: SU: $p<0.000$, df: 2, SUF: $p<0.000$, df: 1/ Received: SU: $p<0.000$, df: 2, SUF: $p<0.001$, df: 1), and she received significantly more events from BBSG in terms of Single groom (SU: $p<0.000$, df; 2, SUF: $p<0.001$, df:1), Proximity (SU: $p<0.000$, df: 1) and Overall body contact (SU: $p<0.000$, df:2, SUF: $p<0.000$, df: 1) events.

Reproductive status:

SF, BBSG and NSF: NSF (POV), a nursing female, was involved in 7 Affiliative event types and showed a preference for BBSG (another nursing female) as a partner. She received significantly more events from BBSG in terms of Proximity (SU: $p<0.000$, df: 3, SUF: $p<0.000$, df: 2), Single groom (SU: $p<0.000$, df: 3, SUF: $p<0.001$, df: 2), Overall body contact (SU: $p<0.000$, df: 3, SUF: $p<0.000$, df: 2) and Overall groom events (SU: $p<0.000$, df: 2, SUF: $p<0.000$, df: 1). NSF (POV) directed more glances towards SF (a nursing female) and the least number towards BBBG, a non nursing female (SU: $p<0.000$, df: 3, SUF: $p<0.000$, df: 3).

Non nursing female preferences:

BBBG (POV) was involved in 6 Affiliative event types and showed a preference for BBSG and SF as a partner. She initiated and received more Affiliative event types towards/from BBSG, receiving significantly more Overall groom events from BBSG (SU: $p<0.001$, df:2), although more Glances were directed towards OMU and SF (SU: $p<0.000$, df: 3, SUF: $p<0.000$, df: 2).

OMU preference for younger and/or nursing individuals (The mother-daughter dyad):

BBSG and SF: Overall OMU (POV) was involved in 7 Affiliative event types. For the majority of Affiliative event types his preferred partner was BBSG (a nursing female) or SF (a younger nursing female); both were members of the only adult mother-daughter dyad present. He directed more Affiliative event types towards SF than towards any other individual, and he also received more Affiliative event types from BBSG than from any other subject. OMU (POV) directed a significantly more events towards SF in Proximity (SU: $p<0.000$, df: 3), Hold lumbar (SU: $p<0.001$, df: 1) and Overall body contact (SU: $p<0.000$, df: 3) events. From SF and BBSG POV, OMU directed significantly more proximity events towards them both than any other individual (see above). OMU (POV) received significantly more events in terms of Overall body contact and Proximity events from BBSG (both event types: SU: $p<0.000$, df: 3). For OMU (POV), more Glance events were directed towards SF than any other individual (SU: $p<0.000$, df: 3), and the least number towards NSF.

Aggression directed towards non nursing and younger females

The pattern of aggression being directed towards non nursing and younger females was only partially supported by the aggressive events analysis at this level. No individual showed significant patterns in the behaviours selected suggesting that, if there was a pattern, analysis at this level wouldn't show it, although this might possibly be due to the relatively small data set. Only NSF and SF (POV) directed more aggressive events towards BBBG than any other individual and, interestingly, BBSG and SF were the most commonly involved individuals (non directional plus directional preferences).

Results section 3: Preferred interaction partners based on prevalence across behavioural event types for the Playground group.

Table 2: Preferred interaction partners by behavioural event type (after the removal of NSF).

Focal Animal	**Event Category**	**Initiated**		**Received**		**Overall**	
		SU	**SUF**	**SU**	**SUF**	**SU**	**SUF**
OMU	**Glance**	SF					
	Stare	BBSG					
	Copulation	BBSG					
	Affiliative partnership preference	SF		BBSG		BBSG	
	Agonistic partnership preference	SF		SF		SF	
	Other partnership preference	BBSG		SF		BBSG/SF	
	Self Groom	3					
BBSG	**Glance**	SF/ OMU	SF				
	Stare	BBBG	BBBG				
	Copulation	3					
	Affiliative partnership preference	OMU	SF	OMU	SF	OMU	SF
	Agonistic partnership preference	BBBG	BBBG			BBBG	BBBG
	Other partnership preference	SF	SF			SF	SF
	Self Groom	28					

Focal Animal	Event Category	Initiated		Received		Overall	
		SU	**SUF**	**SU**	**SUF**	**SU**	**SUF**
BBBG	**Glance**	OMU	SF				
	Stare	OMU					
	Affiliative partnership preference	OMU	SF/ BBSG	OMU	BBSG	OMU	BBSG
	Agonistic partnership preference	OMU		BBSG	BBSG	BBSG/OMU	BBSG
	Other partnership preference			BBSG	BBSG	BBSG	BBSG
	Self Groom	18					
SF	**Glance**	OMU	BBSG				
	Copulation			2			
	Affiliative partnership preference	OMU	BBSG	OMU	BBSG	OMU	BBSG
	Agonistic partnership preference	BBBG	BBBG	BBSG	BBSG	BBSG/OMU	BBSG
	Self Groom	16					

Table 2 shows the summarized results for preferred interaction partners (initiated, received and unknown initiator) for each of the Behavioural events documented in this study. The shift towards OMU as a preferred partner for affiliative interactions as seen in the socio-gram data (previous chapter), was also seen in the across-events data of BBSG and SF, as was the mother-daughter reciprocal preference. BBBG, the only non nursing female present, also expressed a preference for OMU.

Affiliative preferences:

Shift in affiliative preference towards OMU:

BBSG (POV) was involved in 7 Affiliative event types and showed a preference for OMU as a partner, initiating and receiving more Affiliative event types with OMU; furthermore, she directed significantly more events towards OMU in terms of Overall body contact (SU: $p<0.000$, df: 2).

SF (POV) was involved in 7 Affiliative event types and showed a preference for OMU as a partner; she initiated more Affiliative event types towards OMU and received more from him. SF (POV) directed significantly more Glances towards OMU, whilst the non nursing female, BBBG, received the least (SU: $p<0.001$, df: 2).

Although OMU was the preferred interaction partner for both BBSG and SF, amongst the females, the Mother-daughter dyad still showed a strong preference for each other over the non nursing female, BBBG. For example, from SF POV, she received significantly more Proximity events from BBSG than BBBG (SUF: $p<0.000$, df: 1).

BBBG (POV) was involved in 6 Affiliative event types and showed a preference for OMU for receiving and initiating affiliative events.

OMU preference for younger and nursing individuals (The mother-daughter dyad):

BBSG and SF: OMU (POV) was involved in 7 Affiliative event types; he initiated more Affiliative event types to SF, while receiving more from BBSG (mother and daughter, both nursing). SF (younger) received significantly more Overall body contact events, as well as Glances, than any other individual (both: SU: $p<0.000$, df: 2), whilst OMU (POV) initiated and received significantly more Proximity events from/towards BBSG (Initiated/received: SU: $p<0.000$, df: 3).

Aggression directed towards non nursing females.

BBBG: The small number of Agonistic events recorded showed no strong pattern, although both BBSG (POV) and SF (POV) directed more events towards BBBG (non nursing female) than to each other or to OMU.

Other preferences:

BBSG (POV) initiated more Other events types towards SF, her nursing daughter, while OMU (POV) directed more towards BBSG, even though he received more from SF. BBSG was also the preferred partner for BBBG (POV), who received more other event types from her than any other individual.

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Is Results section 3: Preferred interaction partners based on prevalence across behavioural event types for the AMU.

Table 1: Preferred interaction partners by behavioural event types (before the removal of NSF).

Focal Animal	Event Category	Initiated	Received	Overall
S	**Glance**	NS		
	Stare	NS		
	Pseudocopulation	ST		ST
	Affiliative partnership preference	ST	NS	ST
	Agonistic partnership preference	NS	NS	NS
	Other partnership preference	ST	NS	NS/ST
	Self Groom	2		
NS	**Glance**	S		
	Stare	ST		
	Pseudocopulation		ST	ST
	Affiliative partnership preference	ST	S/ST	ST
	Agonistic partnership preference	ST	S	S
	Other partnership preference	ST	S	ST
ST	**Glance**	S		
	Stare	NS		
	Pseudocopulation	NS	S	S
	Affiliative partnership preference	NS	NS	NS
	Agonistic partnership preference	NS	S/NS	NS
	Other partnership preference		S	S
	Self Groom	2		

Table 1 shows the summarized results for preferred interaction partners (initiated, received and unknown initiator) for each of the behavioural events documented in this study. The

AMU was characterised by a pattern of Affiliation, directed towards older individuals, and Aggression, directed towards younger individuals. The age ranking from oldest to youngest, as shown in the methodology, is ST (Oldest), S, NS (Youngest).

Affiliative preferences:

NS: NS (POV) was involved in 7 Affiliative event types. For all of Affiliative event types his preferred partner was ST (the oldest male present). NS (POV) directed more Affiliative events types towards ST than towards S even though he received an equal number of Affiliative event types from S (younger than ST) and ST. NS (POV) was a recipient of Pseudocopulation events from ST.

S: S (POV) was involved in 7 Affiliative event types and showed a preference for ST (an older male) as a partner. S initiated more Affiliative event types to ST, while receiving more from NS (a younger subadult). S (POV) directed a significantly more events towards ST (the older male) in Embrace (SU: $p<0.000$, df: 1), Overall body contact events (SU: $p<0.000$, df: 1) and also Glances (SU: $p<0.000$, df: 1), although technically this was not categorized as an Affiliative event. S (POV) received significantly more events in terms of Proximity (SU: $p<0.000$, df: 1), Lesser body contact (SU: $p<0.000$, df:1), Greater body contact (SU: $p<0.000$, df: 1) and Overall body contact (SU: $p<0.000$, df: 1) events from NS (the younger subadult).

ST: ST (the oldest male POV) was involved in 7 Affiliative event types and showed a preference for NS (the younger subadult) as a partner. ST (POV) initiated more Affiliative event types towards NS than towards S, while ST received more Affiliative event types from NS. ST (POV) initiated more Pseudocopulation events (also technically not classified as an Affiliative event) towards NS (the younger subadult) than towards S (an adult male), while ST received more Pseudocopulation events from S than from NS.

Agonistic preferences:

NS: NS (POV) was involved in 7 Agonistic behavioural event types and showed a preference for S as a partner. NS (POV) initiated more event types towards ST, while receiving more from S.

ST: ST (POV) was involved in 7 Agonistic event types and showed a preference for NS as a partner. ST initiated more Agonistic event types towards NS (younger subadult) than towards S, while ST received an equal number of Agonistic event types from S (an adult male) and NS.

S: S (POV) was involved in 7 Agonistic event types and showed a preference for NS as a partner. S initiated and received more Agonistic event types from NS than from ST.

Other events:

NS: NS (POV) was involved in 4 Other behavioural event types. For the majority of Other event types, his preferred partner was ST. NS (POV) directed more Other event types towards ST than towards S. He received more Other event types from S than from ST.

ST: ST (POV) was involved in 3 Other event types, all received from S (the other adult male), her preferred partner.

S: S (POV) was involved in 4 Other event types, his preferred partners were ST and NS equally. S directed more Other event types towards ST (an older male) than towards any other individual and received more Other event types from NS (a younger subadult).

Results section 3: Preferred interaction partners based on prevalence across behavioural event types for the AMU.

Table 2: Preferred interaction partners by behavioural event types (After the removal of NSF).

Focal Animal	Event Category	Initiated	Received	Overall
S	**Glance**	ST		
	Affiliative partnership preference	NS	NS	NS
	Agonistic partnership preference		ST	ST
	Other partnership preference		NS	NS
	Self Groom	1		
NS	**Glance**	S		
	Affiliative partnership preference	ST	ST	ST
	Agonistic partnership preference	ST/S	S	S
	Other partnership preference	S	ST	S
	Self Groom	2		
ST	**Glance**	S		
	Stare	NS		
	Pseudocopulation		NS	NS
	Affiliative partnership preference	NS	NS	NS
	Agonistic partnership preference	NS	S	NS
	Self Groom	4		

Table 2 shows the summarized results for preferred interaction partners (initiated, received and unknown initiator) for each of the behavioural events documented in this study. The data collected on the AMU for this period, at this level of analysis, showed little in the way of statistically significant results.

Affiliative preferences:

S: S (POV) was involved in 3 Affiliative event types and showed a preference for NS (the younger subadult) as a partner; he initiated and received more Affiliative event types from NS. S (POV) received significantly more events in terms of Proximity from NS, the younger subadult (SU: $p<0.000$, df: 1).

NS: NS (POV) was involved in 7 Affiliative event types and showed a preference for ST (the oldest male present) as a partner. He initiated and received more Affiliative event types from ST than from S.

ST: ST (POV) was involved in 7 Affiliative event types and showed a preference for NS (a younger subadult male) as a partner. He initiated and received more Affiliative event types from NS. ST (POV) showed a preference for NS (a younger subadult male) as a partner.

Agonistic preferences:

S: S (POV) was involved in 1 Agonistic event type, receiving an Agonistic event type from ST (an older male).

NS: NS (POV) was involved in 6 Agonistic event types and showed a preference for S (an adult male) as a partner. He initiated an equal number of Agonistic event types towards ST (the oldest male present) and S, while receiving more from S.

ST: ST (POV) was involved in 5 Agonistic event types and showed a preference for NS (a younger subadult) as a partner. He initiated more Agonistic event types towards NS, while receiving more from S (an adult male).

Other preferences:

S (POV) was involved in 2 Other event types, both received from NS, while from NS POV, NS was involved in 4 Other event types and showed a preference for S (an adult male) as a partner. NS (POV) initiated more Other event types towards S, while receiving more from ST (the oldest male).

Results section 3: Preferred interaction partners based on prevalence across behavioural event types for the Caged female group.

Table 1: Preferred interaction partners by behavioural event types (without the male).

Focal Animal	**Event Category**	**Initiated**	**Received**	**Overall**
SHM	**Glance**	OBN		
	Affiliative partnership preference	BBBG2	BBBG2/OG	BBBG2
	Agonistic partnership preference	OBN	BBBG2/OBN	OBN
	Other partnership preference	OG/BBBG2/WC		OG/BBBG2/WC
	Self Groom	16		
OG	**Glance**	OBN		
	Affiliative partnership preference	SHM	WC	BBBG2/WC
	Agonistic partnership preference	BBBG2	OBN	OBN
	Other partnership preference	SHM	BBBG2	SHM
	Self Groom	19		

Focal Animal	Event Category	Initiated	Received	Overall
OBN	**Glance**	OG		
	Affiliative partnership preference	WC	WC	WC
	Agonistic partnership preference	OG	WC	WC
	Other partnership preference	WC	WC	WC
	Self Groom	33		
BBBG2	**Glance**	SHM		
	Stare	OBN/WC		
	Affiliative partnership preference	SHM	SHM	SHM
	Agonistic partnership preference	OG/WC/OBN	BBBG2/WC	OBN/WC /OG
	Other partnership preference	WC	WC	WC
	Self Groom	32		

Focal Animal	Event Category	Initiated	Received	Overall
WC	**Glance**	OBN		
	Stare	OG		
	Affiliative partnership preference	OBN	OBN	OBN
	Agonistic partnership preference	OBN	OBN	OBN
	Other partnership preference		OBN	OBN
	Self Groom	30		

Table 1 shows the summarized results for preferred interaction partners (initiated, received and unknown initiator) for each of the behavioural events documented in this study. It worth noting that the preference for certain reproductive states seen in some of the subjects could also be because they are within a similar age group (being older than the "daughter" generation), and this may be an alternative (or complementary) source of attraction.

Affiliative preferences:
Mother –Daughter dyad:

WC and OBN: WC (POV) was involved in 7 Affiliative event types and showed a preference for OBN (her daughter and similarly a non nursing female) as a partner. WC (POV) initiated and received more Affiliative event types from OBN. WC (POV) directed significantly more events towards OBN in Single and Overall groom events (both events: SU: $p<0.000$, df: 3). WC (POV) also directed significantly more Glance events towards OBN than towards any other individual (SU: $p<0.000$, df: 3), and the least number of Glance events were directed towards SHM. WC and OBN were also both non nursing females, so shared a similar reproductive status.

OBN (POV) was involved in 10 Affiliative event types and showed a preference for WC (her mother) as a partner. OBN (POV) directed more Affiliative event types towards WC, while receiving more from WC. OBN (POV) directed significantly more Proximity events towards WC (SU: $p<0.000$, df: 3), whilst she (OBN) received significantly more Single groom events from WC (SU: $p<0.000$, df: 2). In terms of Overall groom events, while OBN (POV) initiated more events towards SHM (SU: $p<0.001$, df: 3), she did receive more Overall groom events from WC, her mother (SU: $p<0.000$, df: 2).

OG and BBBG2: OG, a non nursing female (POV), was involved in 9 Affiliative event types and showed a preference for BBBG2 (her nursing mother) and WC (a similarly non nursing female: Reproductive status) as partners, although OG (POV) she initiated more Affiliative event types to SHM (A nursing female) and not her nursing mother, while receiving more from WC.

BBBG2's (POV) preferences appeared to be split between her non nursing daughter OG and the other nursing female, SHM. She was involved in 7 Affiliative event types and showed a preference for SHM as a partner. BBBG2 (POV) initiated and received more Affiliative event types from SHM than any other individual. BBBG2 (POV) directed significantly more events towards SHM in Proximity (SU: $p<0.000$, df: 3) and more in terms of Single groom for OG (SU: $p<0.000$, df: 3). BBBG2 (POV) received significantly more Proximity (SU: $p<0.000$, df: 3), Single and Overall groom events from OG (both events: SU: $p<0.000$, df: 3).

Reproductive status:

SHM and BBBG2: SHM, a nursing female (POV), was involved in 9 Affiliative event types and showed a preference for BBBG2 (the other nursing female) as a partner. SHM (POV) initiated more Affiliative event types to BBBG2, while receiving more from BBBG2 and her non nursing daughter OG. SHM (POV) directed significantly more events towards BBBG2 in Proximity (SU: $p<0.000$, df: 3) and Overall body contact events (SU: $p<0.001$, df: 3), and received significantly more Proximity events from BBBG2 (SU: $p<0.000$, df: 3).

Agonistic preferences:

Aggression directed towards non nursing and/or younger females

OG, WC and OBN: SHM (POV) was involved in 3 Agonistic event types and showed a preference for OBN (a younger, non nursing female) as a partner. She initiated more Agonistic event types towards OBN and received more from BBBG2/OBN. OG (POV) was involved in 3 Agonistic event types and showed a preference for OBN (a non nursing female) as a partner; she initiated more Agonistic event types towards BBBG2 (her older nursing mother) and received more from OBN (from OG POV a slightly older female). OBN (POV) was involved in 6 Agonistic event types and showed a preference for WC (her mother, a non nursing female) as a partner; she initiated more Agonistic event types towards OG (a similarly aged non nursing female) and received more from WC (her older mother). BBBG2 (POV) was involved in 1 Agonistic event type, Approach-retreat, which she directed equally to OBN, OG and WC (all non nursing and possibly younger individuals); she did not receive any Agonistic events. WC (POV) was involved in 7 Agonistic event types and showed a preference for OBN (the younger non nursing daughter); she initiated and received more Agonistic event types from OBN.

Other preferences:

SHM (POV) was involved in 2 Other event types, all initiated by her, and directed equally towards OG, BBBG2 and WC. OG (POV) was involved in 3 Other event types and showed a preference for SHM (a nursing female) as a partner; she initiated more Other event types towards SHM and received more from BBBG2 (her nursing mother). OBN (POV) was involved in 1 Other event type, received and initiated by WC. BBBG2 (POV) was involved in 1 Other event type, Grab, directed towards WC; she did not receive any Other event types. WC (POV) was involved in 1 Other event type, received from OBN (her non nursing daughter), and did not initiate any Other events.

Results section 3: Preferred interaction partners based on prevalence across behavioural event types for the Caged female group.

Table 2: Preferred interaction partners by behavioural event types (with the male present).

Focal Animal	**Event Category**	**Initiated**		**Received**		**Overall**	
		SU	**SUF**	**SU**	**SUF**	**SU**	**SUF**
OBN	**Glance**	MALE	WC				
	Stare	BBBG2	BBBG2				
	Affiliative partnership preference	WC	WC	WC	WC	WC	WC
	Agonistic partnership preference	MALE/OG/WC	OG/WC	WC	WC	WC	WC
	Self Groom	10					
BBBG2	**Glance**	MALE	SHM				
	Affiliative partnership preference	SHM	SHM	OG	OG	SHM	SHM
	Agonistic partnership preference			MALE		MALE	
	Other partnership preference	SHM	SHM			SHM	SHM
	Self Groom	10					

WC	**Glance**	MALE	OBN				
	Affiliative partnership preference	SHM	SHM	OBN	OBN	OBN	OBN
	Agonistic partnership preference	OBN	OBN	MALE		MALE/OBN	OBN
	Self Groom	8					
SHM	**Glance**	WC	WC				
	Affiliative partnership preference	BBBG2	BBBG2	BBBG2/ OG	BBBG2/ OG	BBBG2	BBBG2
	Agonistic partnership preference			BBBG2/MALE	BBBG2	BBBG2	BBBG2
	Self Groom	1					
OG	**Glance**	MALE	OBN				
	Stare	OBN					
	Copulation						
	Affiliative partnership preference	BBBG2	BBBG2	BBBG2	BBBG2	BBBG2	BBBG2
	Agonistic partnership preference	WC	WC	MALE	WC	Male/WC	WC
	Self Groom	10					

Table 2 shows the summarized results for preferred interaction partners (initiated, received and unknown initiator) for each of the behavioural events documented in this study. The presence of the introduced male did not appear to alter the affiliative preferences expressed by this group, although BBBG2's preference for the other nursing female seemed to become more marked.

Affiliative preferences:

Mother –Daughter preference

OG and BBBG2: OG (POV) was involved in 7 Affiliative event types and showed a preference for BBBG2 (her nursing mother) as a partner; she initiated and received more Affiliative event types from BBBG2, and initiated significantly more Proximity events towards BBBG2, while significantly receiving more from BBBG2 (Initiated/received: SU+male: p<0.000, df: 4, SU: p<0.000, df; 3). Most glances were directed towards the male followed by OBN (SU+male: p<0.000, df: 4, SU: p<0.000, df: 3).

OBN and WC: OBN (POV) was involved in 8 Affiliative event types and showed a preference for WC (her non nursing mother: Reproductive status) as a partner. OBN (POV) initiated and received more Affiliative event types from WC, however, she directed significantly more Glance events towards the Male even though WC, the mother, received more among the females (SU+male: p<0.000, df: 4, SU: p<0.000, df: 3). OBN (POV) initiated towards and received from significantly more Proximity events towards/from WC (Initiated/received: SU+male: p<0.000, df: 4, SU: p<0.000, df: 3).

WC (POV) was involved in 8 Affiliative event types and showed a preference for OBN (her non nursing daughter: Reproductive status) as a partner. She initiated more Affiliative event types towards SHM (a nursing female), and received more from OBN than from any other subject. WC (POV) initiated significantly more proximity events towards OBN (SU+male: p<0.001, df: 4, SU: p<0.001, df: 3).

Reproductive status:

SHM and BBBG2: SHM, a nursing female (POV) was involved in 5 Affiliative event types and showed a preference for BBBG2 (another nursing female) as a partner initiating more Affiliative event types to BBBG2 and receiving more from BBBG2/OG (her non nursing daughter). BBBG2 (POV) was involved in 5 Affiliative event types and showed a preference for SHM (another nursing female) as a partner. BBBG2 initiated more Affiliative event types towards SHM, while receiving more from OG (her non nursing daughter). BBBG2 (POV) initiated more Proximity events towards SHM (SU+male: SU: $p<0.000$, df: 3).

Agonistic preferences:

The pattern of aggression being directed towards non nursing and younger females was only partially supported by the aggressive events analysis. No individual showed statistically significant patterns in the behaviours selected, suggesting that, if there was a pattern, analysis at this level may not show it, possibly due to the relatively small size of the data set when divided into individual behavioural events.

SHM (POV) was involved in 2 Agonistic event types and showed a preference for BBBG2 as a partner. She received more event types from the male and BBBG2, and initiated no Agonistic events.

OG (POV) was involved in 2 Agonistic event types and showed a preference for the male and WC (another non nursing female) as a partner. OG (POV) initiated more Agonistic event types towards WC and received more from the male and WC.

OBN was involved in 6 Agonistic event types and showed a preference for WC (her non nursing mother) as a partner. OBN initiated more Agonistic event types towards the Male, OG (a non nursing female) and WC, while receiving more from WC.

SHM (POV) was involved in 2 Agonistic event types and showed a preference for BBBG2 (a similarly aged nursing female) as a partner. She received more event types from and the Male and BBBG2. SHM (POV) initiated no Agonistic events.

BBBG2 (POV) was involved in 1 Agonistic event type, Approach (walk)-retreat, which she received from the male. BBBG2 did not initiate any Agonistic event types.

WC (POV) was involved in 2 Agonistic event types and showed a preference for the male and OBN (her younger, non nursing daughter) as a partner. WC (POV) initiated more Agonistic event types towards OBN than towards any other individual, while receiving Agonistic events only from the male.

Other preferences:

Only SF (POV) was involved in Other event types; this was Tail grab, directed towards SHM.

Results section 3: Preferred interaction partners based on prevalence across behavioural event types for JB unit.

Table 1: Preferred interaction partners by behavioural event type (before the 2006 Birth season).

Focal Animal	**Event Category**	**Initiated**		**Received**		**Overall**	
		SU	**SUF**	**SU**	**SUF**	**SU**	**SUF**
YL	**Copulation**			1			
	Pseudocopulation	YZM	YZM			YZM	YZM
	Affiliative partnership preference	DBC	DBC	DBC	DBC	DBC	DBC
	Agonistic partnership preference	XBC	XBC	JB male		XBC	XBC
	Other partnership preference	DBC	DBC			DBC	DBC
	Self Groom	40					
XK	**Affiliative partnership preference**	XBC/YZM	YZM	YZM	YZM	YZM	YZM
	Self Groom	8					

Focal Animal	Event Category	Initiated		Received		Overall	
		SU	**SUF**	**SU**	**SUF**	**SU**	**SUF**
XBC	**Copulation**			3			
	Pseudocopulation						
	Affiliative partnership preference	JB male	XK	JB male	DBC /YZM	JB male	DBC/XK /YZM
	Agonistic partnership preference			JB male		JB male	
	Self Groom	4					
JB male	**Copulation**	XBC				XBC	
	Affiliative partnership preference	BD		DBC		DBC/BD	
	Agonistic partnership preference	DBC/ XBC		BD/ YL		DBC/XBC/ YL	
	Self Groom	2					

Focal Animal	**Event Category**	**Initiated**		**Received**		**Overall**	
		SU	**SUF**	**SU**	**SUF**	**SU**	**SUF**
DBC	**Copulation**			3			
	Affiliative partnership preference	XBC	XBC	XBC/JB male	XBC	XBC/ XK	XK/ XBC
	Agonistic partnership preference	XBC	XBC	BD/XK/ YZM/ YL	BD/XK/ YZM /YL	BD/ XBC/ XK/ YZM/ YL	BD/ XBC/ XK / YZM / YL
	Other partnership preference	YZM	YZM			YZM	YZM
	Self Groom	17					
BD	**Copulation**			2			
	Affiliative partnership preference	JB male	XBC/ YZM	JB male	XBC	JB male	XBC
	Agonistic partnership preference			JB male		JB male	
	Other partnership preference			JB male		JB male	
	Self Groom	18					

Focal Animal	Event Category	Initiated		Received		Overall	
		SU	**SUF**	**SU**	**SUF**	**SU**	**SUF**
YZM	**Affiliative partnership preference**	XBC	XBC	XBC/JB male	XBC	XK	XK
	Agonistic partnership preference	XBC/ JB male/ DBC	XBC/ DBC	YL	YL	JB male/ YL	YL
	Other partnership preference			YL/JB male	YL	YL/ JB male	YL
	Self Groom	28					

Table 1 shows the summarized results for preferred interaction partners (initiated, received and unknown initiator) for each of the behavioural events documented in this study. Patterns of preferences similar to those seen in the Captive groups were also expressed here, although they were not universal; in particular, the male's (JB male) preference for younger and non nursing individuals, and the attraction of individuals of similar reproductive status. The attraction within the Mother-daughter dyads appeared to decrease, now that it was examined across age classes (adult and subadult). It is possible that some of the variations seen here are the result of the number of interactions where one of the members could not be identified so would not be included in the analysis at this level, or the small size of the data sets documented.

Affiliative preferences:

Mother –Daughter dyad:

DBC and YL: YL (POV) was involved in 7 Affiliative event types and showed a preference for DBC (her similarly non nursing daughter: reproductive status) as a partner. She initiated and received more Affiliative event types from DBC, although from DBC POV, across the 7 Affiliative event types she was involved in, she showed a preference for XK (a nursing female) and XBC (similarly non nursing subadult: Reproductive status, also similarly aged) as a partner. DBC initiated more Affiliative event types to XBC, while receiving more from XBC and JB male.

Male preference for younger, non nursing individuals

XBC, DBC and BD: XBC (POV) was involved in 2 Affiliative event types and showed a preference for JB male and DBC (a similarly non nursing similarly aged subadult), XK (her nursing mother), and YZM (a nursing female) as a partner. XBC initiated more Affiliative event types towards JB male and XK and received more from JB male and DBC/YZM.

JB male (POV) was involved in 6 Affiliative event types and showed a preference for XBC (a younger, non nursing subadult) as a partner. He initiated more Affiliative event types towards BD (a non nursing female), while receiving more from DBC (a younger non nursing subadult).

BD (POV) was involved in 8 Affiliative event types and showed a preference for JB male and XBC (a subadult, similarly non nursing: Reproductive status) as a partner. She initiated more Affiliative event types to JB male followed by XBC and YZM (a nursing female), while receiving more from JB male, followed by XBC.

Reproductive status:

XK (POV) was involved in 7 Affiliative event types and showed a preference for YZM (a nursing female) as a partner. XK (POV) initiated more Affiliative event types to XBC (her daughter) and YZM, while receiving more from YZM.

YZM (POV) was involved in 7 Affiliative event types and showed a preference for XK (a nursing female) as a partner although YZM initiated to XBC (a non nursing subadult), while received more Affiliative event types from XBC (a non nursing subadult) and JB male.

Agonistic preferences:
Aggression directed towards non nursing and younger females

XBC (POV) was involved in 1 Agonistic event type, receiving this type more from JB male than any other individual. She did not initiate any Agonistic event types.

YL (POV) was involved in 2 Agonistic event types and showed a preference for XBC (the younger non nursing subadult) as a partner. She initiated more Agonistic event types towards DBC (her younger non nursing daughter), and received more Agonistic event types from JB male.

XBC (POV) was involved in 1 Agonistic event type, receiving this type more from JB male than any other individual. She did not initiate any Agonistic event types.

JB male (POV) was involved in 2 Agonistic event types and showed a preference for DBC and XBC (younger, non nursing subadults) and YL (adult nursing female) as partners. He initiated more Agonistic event types towards DBC and XBC, and received more from BD (adult female) and YL.

DBC (POV) was involved in 1 Agonistic event type and showed a preference for BD/YL (adult females), XK/YZM (nursing adult females) and XBC (a similarly aged, non nursing subadult) as partners. DBC initiated more Agonistic event types towards XBC and she received more from BD, XK, YZM and YL.

BD (POV) was involved in 1 Agonistic event type and showed a preference for JB male as a partner; she initiated more Agonistic event types towards JB male, and received them only from JB male.

YZM (POV) was involved in 4 Agonistic event types and showed a preference for JB male and YL (a non nursing female). She initiated more Agonistic event types towards JB male and XBC/DBC (younger, non nursing subadults), while receiving more from YL.

Other preferences:

YL (POV) was involved in 1 Other Behavioural event type, directed towards DBC. DBC (POV) was involved in 1 Other event during this period, directed towards YZM, her preferred partner. YZM (POV) was involved in 2 Other event types and showed a preference for JB male (the male) and YL (a non nursing female) as a partner. She initiated no Other event types, and received more from JB male and YL. BD (POV) was involved in 1 Other event type, which she received from JB male.

Results section 3: Preferred interaction partners based on prevalence across behavioural event types for JB unit.

Table 2: Preferred interaction partners by behavioural event type (after the 2006 Birth season).

Focal Animal	**Event Category**	**Initiated**		**Received**		**Overall**	
		SU	**SUF**	**SU**	**SUF**	**SU**	**SUF**
XK	**Copulation**			1			
	Affiliative partnership preference	YL	YL	YL	YL	YL	YL
	Self Groom	31					
XBC	**Affiliative partnership preference**	DBC/XK	DBC/ XK	XK	XK	XK	XK
	Agonistic partnership preference	DBC	DBC	JB male		DBC/ JB male	DBC
	Self Groom	16					
JB male	**Copulation**	DBC/YZM				DBC/YZ M	
	Affiliative partnership preference	DBC		DBC		DBC	
	Agonistic partnership preference	DBC				DBC	
	Self Groom	5					

Focal Animal	Event Category	Initiated		Received		Overall	
		SU	**SUF**	**SU**	**SUF**	**SU**	**SUF**
DBC	**Affiliative partnership preference**	YL	YL	YL	YL	YL	YL
	Agonistic partnership preference	XBC	XBC	XBC	XBC	XBC	XBC
	Self Groom	31					
BD	**Affiliative partnership preference**	XBC	XBC	JB male	XBC	JB male	XBC
	Other partnership preference			JB male /YZM	YZM	JB male/ YZM	YZM
	Self Groom	40					
YZM	**Affiliative partnership preference**	XBC	XBC	DBC	DBC	XBC	XBC
	Agonistic partnership preference			JB male/XK	XK	JB male/XK	XK
	Self Groom	24					
YL	**Affiliative partnership preference**	DBC	DBC	DBC	DBC	DBC	DBC
	Agonistic partnership preference	BD	BD	DBC	DBC	BD/DBC	BD/ DBC
	Self Groom	36					

Table 2 shows the summarized results for preferred interaction partners (initiated, received and unknown initiator) for each of the behavioural events documented in this study. The maturation of the two unit subadults, and changes in reproductive status of some of the individuals, appear to have coincided with changes in the pattern of preferences documented for this unit.

Affiliative preferences:

Mother –Daughter preference:

YL and DBC: YL (POV) was involved in 6 Affiliative event types and showed a preference for DBC (her daughter) as a partner. YL (POV) initiated and received more Affiliative event types to DBC. She directed significantly more events towards DBC in terms of Proximity (SU: $p<0.000$, df: 5, SUF: $p<0.000$, df: 4), and received significantly more Single groom (SU: $p<0.000$, df: 4, SUF: $p<0.000$, df: 4) and Overall groom events (SU: $p<0.000$, df: 4) from DBC (her non nursing daughter).

DBC (POV) was involved in 6 Affiliative event types and showed a preference for YL (her nursing mother) as a partner. She initiated and received more Affiliative event types from YL, and directed significantly more Single and Overall groom events towards YL (both events: SU: $p<0.000$, df: 4, SUF: $p<0.000$, df: 3). She also received significantly more Overall groom events from YL (SU: $p<0.001$, df: 2, SUF: $p<0.001$, df: 2).

XBC and XK: XBC (POV) was involved in 5 Affiliative event types and showed a preference for XK (her mother) as a partner. She initiated more Affiliative event types to DBC (a similarly aged female) and XK and received more from XK.

Reproductive status:

Attraction of nursing females:

YL and XBC: XK (POV, non nursing female) was involved in 6 Affiliative event types and showed a preference not for her non nursing daughter but for YL (a nursing female) as a partner. She initiated and received more Affiliative event types from YL

YZM (POV) was involved in 7 Affiliative event types and showed a preference for XBC as a partner. She initiated more Affiliative event types to XBC (a nursing female), while receiving more from DBC (another non nursing female); and she directed significantly more Single groom events towards XBC (SU: $p<0.000$, df: 4).

Male preference for younger and non nursing individuals

XBC and BD: JB male (POV) was involved in 7 Affiliative event types and showed a preference for XBC (a young nursing female) and BD (a non nursing female) as a partner. He initiated and received more Affiliative event types from DBC (a young, non nursing female).

BD, a non nursing female (POV), was involved in 7 Affiliative event types and showed a preference for JB male followed by XBC, a young nursing female (Reproductive status: attraction of nursing females), as a partner. BD initiated more Affiliative event types to XBC and received more from JB male and XBC, among the females, and directed a significantly more events towards JB male in terms of Single groom and Overall groom events (Both events: SU: $p<0.001$, df: 3).

Agonistic preferences:

Aggression directed towards non nursing and/or younger females

YL (POV) was involved in 1 Agonistic Behavioural event type, directing the Agonistic event type towards BD (non nursing female), and receiving the Agonistic event type from DBC (her daughter).

XBC (POV) was involved in 2 Agonistic event types and showed a preference for JB male and DBC (a young, non nursing female) as a partner. She initiated more Agonistic event types towards DBC, while receiving more from JB male.

JB male (POV) was involved in 3 Agonistic event types and showed a preference for DBC (a young non nursing female) as a partner., and initiated more Agonistic event types towards DBC. He did not receive any Agonistic events.

DBC (POV) was involved in 2 Agonistic event types. For all of them, her preferred partner was XBC (a young female); she directed more Agonistic events (types) towards XBC than towards any other individual and she also received more Agonistic events from XBC than from any other subject.

YZM (POV) was involved in 2 Agonistic event types as a recipient, with JB male and XK (non nursing female) equally represented, both her preferred partners. She did not initiate any Agonistic events.

Other preferences:

BD (POV) was involved in 2 Other event types, with YZM (a non nursing female) and JB male being equally represented in overall partner preference and directing Other event types towards BD.

Results section 3: Preferred interaction partners based on prevalence across behavioural event types for the WRT.

Table 1: Preferred interaction partners by behavioural event types.

Focal Animal	**Event Category**	**Initiated**		**Received**		**Overall**	
		SU	**SUF**	**SU**	**SUF**	**SU**	**SUF**
Male	**Copulation**	F	F				
	Affiliative partnership preference	F	F	F	F	F	F
	Agonistic partnership preference	F	F	F	F	F	F
Female	**Copulation**			6		6	
	Affiliative partnership preference	F(I)	F(I)	F	F	F(I)	F(I)
	Agonistic partnership preference	F	F	M		M	F
	Other partnership preference	SA	SA			SA	SA
Subadult	**Affiliative partnership preference**	F	F	F	F	F	F
	Agonistic partnership preference	M/SA	SA	M		M/SA	SA

Key:
F (I) = Female embracing immature at time of scoring, **F**= Female not embracing an immature at time of scoring, **M**= Male, **SA (I) =**Subadult embracing an immature at time of scoring, **SA**= Subadult not embracing an immature at time of scoring

Table 1 shows the summarized results for preferred interaction partners (initiated, received and unknown initiator) for each of the behavioural events documented in this study. Females, in general, were a more attractive affiliative partner for other females than other age sex classes, although the presence of an immature appeared to increase the overall attractiveness of a female compared to other age/sex classes, and females with an immature were rarely the recipient of aggression, instead aggression was either directed to or involved age/sex classes not carrying immatures. Although it needs to be noted that some of the preferences may simply be the result of a greater representation of an age/sex class (or reproductive status) in the social group. The statistical categories used in this section are the same as used for statistical analysis in Results section 2: socio-grams.

Affiliative preferences:

Females Preference for females nursing immature (F (I)).

UF (POV) was involved in 8 Affiliative event types and showed a preference for F (I) as a partner. She initiated more Affiliative event types to F (I), while receiving more from F. UF (POV) directed a significantly more events towards F(I) in Lesser body contact (SU2: $p<0.000$, df:1, SUF2 $p<0.000$, df: 1), Single groom (SU1: $p<0.000$, df:4, SU2: $p<0.000$, df:3, SUF1: $p<0.000$, df: 2, SUF2 $p<0.000$, df: 1), Overall groom (SU1: $p<0.000$, df:4, SU2: $p<0.000$, df:2, SUF1: $p<0.000$, df: 3, SUF2 $p<0.000$, df: 1) and Overall body contact events (Initiated: SU1: $p<0.000$, df:4, SU2: $p<0.000$, df:2, SUF1: $p<0.000$, df: 3, SUF2: $p<0.000$, df: 1), while directing significantly more events towards F in terms of Proximity and Reciprocal groom events (SU2: $p<0.000$, df:2, SUF2 $p<0.000$, df: 1). UF (POV) received significantly more events from F in terms of Proximity (Initiated/received: SU1: $p<0.000$, df:4, SU2: $p<0.000$, df:2, SUF1: $p<0.000$, df: 3, SUF2 $p<0.000$, df: 1), Single groom (SU1: $p<0.000$, df:4, SU2: $p<0.000$, df:2, SUF1: $p<0.000$, df: 3, SUF2: $p<0.000$, df: 1), Overall groom (SU1: $p<0.000$, df:4, SU2: $p<0.000$, df:2, SUF1: $p<0.000$, df: 3, SUF2: $p<0.000$, df: 1) whilst receiving significantly more events from F(I) in terms of Reciprocal groom (SU1: $p<0.000$, df:4, SU2: $p<0.000$, df:2, SUF1: $p<0.000$, df: 3, SUF2 $p<0.000$, df: 1). The Classifications SA, SA(I) and male were never the significantly preferred interaction partners from UF POV.

Preference for female over male as an affiliative partner

USA (POV) was involved in 7 Affiliative event types and showed a preference for F as a partner. USA initiated more Affiliative event types to F and received more from F. USA (POV) directed significantly more events towards F in terms of Proximity (SU1: $p<0.000$, df:3, SU2: $p<0.000$, df:2, SUF1: $p<0.000$, df: 2, SUF2 $p<0.000$, df: 1), Single groom (SU1: $p<0.000$, df:3, SU2: $p<0.000$, df:2, SUF1: $p<0.000$, df: 2, SUF2 $p<0.000$, df: 1) and Overall groom events (SU1: $p<0.000$, df:3, SU2: $p<0.000$, df:2, SUF1: $p<0.000$, df: 2, SUF2: $p<0.000$, df: 1). USA (POV) received significantly more events from F in terms of Proximity (SU1: $p<0.001$, df:2, SU2: $p<0.000$, df:2, SUF1: $p<0.000$, df: 1, SUF2 $p<0.000$, df: 1), Single groom (SU2: $p<0.000$, df:1) and Overall groom events(SU1: $p<0.000$, df:2, SU2: $p<0.000$, df:1, SUF1: $p<0.000$, df: 1).

Male's preference for non nursing females (Females not carrying immatures)

UM (POV) was involved in 8 Affiliative event types and showed a preference for F as a partner. He initiated more Affiliative event types to F, while receiving more from F. UM (POV) directed significantly more events towards F in terms of Proximity and Overall body contact (SU1: $p<0.001$, df: 2, SU2: $p<0.000$, df: 1) events. UM (POV) received significantly more events from F in terms of Proximity (Initiated/received: SU1: $p<0.000$, df: 3, SU2: $p<0.000$, df: 1) and Overall groom events (SU1: $p<0.000$, df: 3, SU2: $p<0.000$, df: 1), although UM received more Single groom events from F(I) (SU1: $p<0.000$, df: 3, SU2: $p<0.000$, df: 1).

Agonistic preferences:
Females without immatures were more likely recipients of aggression.

UF (POV) was involved in 3 Agonistic event types. For the majority of Agonistic event types her preferred partner was M followed by F. UF (POV) directed more Agonistic events types towards F than towards any other individual, and she received more Agonistic event types from M than from any other subject. USA (POV) was involved in 2 Agonistic event types and showed a preference for the M and SA as a partner. USA initiated more

Agonistic event types towards M and SA and received more from M. UM (POV) was involved in 6 Agonistic event types and showed a preference for F as a partner; she initiated all Agonistic event types towards F and received all from F. Contrasting this is UM (POV) results for Displacement, where significantly more Displacement events involved F(I) than any other age/Sex class with F(I) receiving significantly more Displacement events from UM (POV) (SU1: $p<0.000$, df: 2, SU2: $p<0.000$, df: 1).

Other preferences:

UF (POV) was involved in 1 Other Behavioural event type, directed towards from SA, her preferred partner. UF did not receive any Other events.

Results section 4: Displacement events based dominance hierarchies.

Table 1 (a-e) shows the resulting hierarchy based on displacement events (see Appendix for data sets). The small number of Agonistic events makes these displacement based analyses of hierarchies difficult, but some patterns of displacement rates were identified in some of the study groups.

Table 1a. Displacement events based dominance hierarchies for the Playground group

Dominance hierarchy relevant events before removal of NSF (Playground Group)				
OMU	**NSF**	**BBSG**	**BBBG**	**SF**
1. NSF(0 events)/ OMU MALE (focal) 2. BBBG (-1) 3. BBSG(-2) 4. SF (-6)	1. SF (+9) 2. BBSG (+3) 3. OMU (+1) 4. NSF (focal) 5. BBBG (-9)	1. OMU(+2) 2. BBSG (focal) 3. NSF(-3) 4. SF (-5) 5. BBBG (-11)	1. BBSG (+18) 2. OMU/NSF/ SF (+4) 3. BBBG (focal)	1. BBSG (+9) 2. OMU (+6) 3. NSF (0 events)/SF(focal) 4. BBBG (-4)

Dominance hierarchy relevant events after removal of NSF (Playground group)			
OMU	**BBSG**	**BBBG**	**SF**
***	1. OMU(0 events)/BBSG (focal) 2. SF (-1) 3. BBBG (-5)	1. BBSG (+4) 2. SF (+2) 3. OMU (0 events)/BBBG (focal)	1. BBSG/OMU (+1) 2. SF(focal) 3. BBBG (-1)

Table 1a shows the dominance hierarchies constructed from each subject POV for the Playground group. 3 possible patterns of ranking and interaction (displacement) were identified.

1. Displacement based aggression directed towards younger and/or non nursing individuals.

BBBG, a younger non nursing female, was lowest ranked for most subjects before the removal of NSF. BBBG was displaced by all individuals within the Social unit, in particular BBSG (Nursing mother in a mother-daughter Dyad, SU: $p<0.001$, df: 3). BBBG (POV, before removal of NSF) initiated only two Displacement events, 1 each towards NSF (an older nursing female) and SF (a younger nursing daughter of the mother –daughter dyad). The low ranking of BBBG continued after the removal of NSF; BBBG was displaced by all individuals within the SU, in particular BBSG. BBBG (POV) initiated only one Displacement event, towards OMU (the unit resident male).

2. High ranking of the male

The male appeared high ranked, higher ranked than almost every other focal subject. OMU (POV) was not displaced by any individual and NSF (an older nursing female) was the only individual not displaced by him. SF (the youngest nursing female) received more Displacement events from OMU (POV) than any other individual. There were no displacement events recorded from the OMU POV after the removal of NSF.

3. Displacement rates could be correlated with age and or reproductive status.

NSF (POV) displaced only one individual, BBBG (a younger non nursing female), but was displaced by all other individuals within the SU, in particular SF (the younger nursing daughter of the mother-daughter dyad). BBSG (POV, the nursing mother of the mother-daughter dyad) displaced all other individuals and was displaced only by OMU (the unit resident male) before the removal of NSF while, after her removal, BBSG (POV) continued to displaced all other individuals (5 towards BBBG, a non nursing younger female, 1 towards SF, her younger nursing daughter) except OMU with whom she was not observed to interact in Displacement events. SF (POV), before the removal of NSF, received Displacement events from all subjects except NSF and BBBG (a younger non nursing female). Overall, Displacement events from SF POV, before the removal of NSF, occurred most often with BBSG (her older mother, also nursing) from whom the focal received more than any other subject, and who directed more towards BBBG (a non nursing female), although, after the removal of NSF, SF (POV) was displaced by OMU and BBSG, and continued to displace BBBG.

Table 1b. Displacement events based dominance hierarchies for the AMU

Dominance hierarchy relevant events before removal of NSF (AMU)		
ST	**NS**	**S**
1. S(+15) 2. NS(+10) 3. ST(focal)	1. S(+20) 2. NS(focal) 3. ST(-9)	1. NS(?)/S(focal) 2. ST(-17)
Dominance hierarchy relevant events after removal of NSF (AMU)		
ST	**NS**	**S**
1. S(+3) 2. ST(focal) 3. NS(-2)	1. S(+1) 2. NS(focal) 3. ST(-3)	1. ST(+8) 2. NS(?)/S(focal)

Table 1b shows the dominance hierarchies constructed from each subject POV for the AMU. Surprisingly the older individual ST was the lowest ranked individual across the AMU; ST (POV, before the removal of NSF) initiated no Displacement events and received more events from S than from NS (the younger of the two remaining males), and, after removal of NSF, initiated an equal number of Displacement events towards S and NS. ST (POV), after the removal of NSF, received displacement events only from S. NS (POV) displaced only ST and received more Displacement events from S (an older male) than from ST, a pattern that was continued after the removal of NSF, when ST was still the preferred partner (S POV). NS (POV, after the removal of NSF) displaced only ST and received more Displacement events from S than from ST.

S (POV) directed more Displacement events towards ST than towards NS and received more events from NS than from ST before the removal of NSF, although, after the removal of NSF, S (POV) did not initiate any Displacement events and only received Displacement events from ST.

Table 1c. Displacement events based dominance hierarchies for the Caged female group.

Dominance hierarchy relevant events for CAGED FEMALE Group before introduction of the Male				
SHM	**OG**	**OBN**	**BBBG2**	**WC**
1. BBBG2(+1) 2. WC(0 events) /SHM(Focal) 3. OBN/OG(-1)	1. OBN(+1) 2. SHM/WC (0 events)/ OG(Focal) 3. BBBG2(-1)	1. BBBG2(+3) 2. SHM(+1) 3. OBN(focal) 4. WC(-1) 5. OG(-2)	1. SHM (0 events)/ BBBG2(focal) 2. OBN/ OG/WC(-1)	1. BBBG2/ SHM(+1) 2. WC(Focal) 3. OBN/OG(-1)
Dominance hierarchy relevant events for CAGED FEMALE Group after introduction of the Male				
SHM	**OG**	**OBN**	**BBBG2**	**WC**
1. BBBG2/ Male(+1) 2. OBN/ OG/WC/ SHM(FOCAL)	1. Male(+8) 2. WC / BBBG2/ OBN/ SHM (0 events) / OG(Focal)	1. Male(+9) 2. WC(+2) 3. BBBG/OG/ SHM (0 events)/ OBN(focal)	1. Male(+1) 2. OBN/OG/ SHM/ WC (0 events)/ BBBG2(focal)	1. Male(+5) 2. BBBG/OBN /OG/ SHM (0 events)/ WC(FOCAL)

Table 1c shows the dominance hierarchies constructed from each subject POV for the Caged female group. 2 possible patterns of ranking and interaction (displacement) were identified, which partially correspond with the patterns suggested by the Playground group.

1. Older nursing females are higher ranked

Females who were nursing (BBBG2 and SHM, also two of the older individuals) were usually higher ranked (from all focal points of view), BBBG2 (POV, without the male present), an older female nursing an infant and with an adult female daughter present, displaced all individuals present equally except for SHM (a older nursing female), with whom she did not interact in a Displacement event, and she did not receive any Displacement events. With the male present, there was only 1 displacement event recorded from BBBG2 POV, this being initiated by the introduced male.

2. Younger and/or non nursing females are more likely low ranked

From SHM (an older nursing female) POV without the male present directed 2 events, 1 event each to OBN and OG (both younger and non nursing), and received 1 Displacement event from BBBG2 (the other older nursing female). With the male present, SHM (POV) received 2 events, 1 each from BBBG2 and male. SHM (POV with the male present) did not initiate any Displacement events. WC (POV, without the male present) directed more Displacement events towards OBN, and received the more events from OBN, than from any other individual.

Overall, BBBG2 (her nursing older mother) and OBN (a younger non nursing female) were the only partners for OG POV (without the male present). OG (POV without male present) directed only 1 Displacement event, towards BBBG2 and received only 1 Displacement event, from OBN. When the male was introduced, OG (POV) received 1 Displacement event from WC (an older female), and 7 Displacement events from the male. OG, a younger, non nursing female, (POV, with the male present) initiated no displacement events.

OBN (POV), without the male present, initiated more Displacement events towards OG (a similarly aged and non nursing female) than towards any other individual. OBN (POV, without the male present) was displaced by BBBG2 (an older nursing female) more often than by any other individual. OBN (POV), with the male present, initiated Displacement events only towards the male, and was displaced by him more often than by any other individual.

The male, as in the Playground group, was the highest ranked across the entire group; this is to be expected considering the high level of sexual dimorphism in this species and the enforced close proximity. WC (POV, with the male present) was involved in 5 Displacement events, consisting of 5 events received by WC from the male.

Table 1d. Displacement events based dominance hierarchies for JB unit.

Dominance hierarchy relevant events JB unit (before Birth season)						
YL	**XK**	**XBC**	**JB MALE**	**DBC**	**BD**	**YZM**
1. JB male(+1) 2. BD/XK/ YZM/DBC/ YL(Focal) 3. XBC(-1)	***	1. JB male(+1) 2. BD/DBC/XK/ YZM/YL (0 events)/XBC (focal)	1. BD/YL(+1) 2. XK/YZM (0 events) JB male (Focal) 3. DBC/XBC(-1)	1. BD/XK/ YZM/YL (+1) 2. JB male (0 events)/ DBC(Focal) 3. XBC(-1)	1. JB male (+1) 2. XBC/DBC/ XK/ YZM/YL (0 events)/ BD(Focal)	1. YL(+2) 2. JB male/(+1) 3. BD/DBC/ XK(0 events)/ YZM(Focal) 4. XBC(-1)
Dominance hierarchy relevant events JB unit (after Birth season)						
YL	XK	XBC	JB MALE	DBC	BD	YZM
1. DBC(+1) 2. JB male/XBC/ YZM/XK (0 events)/ YL(Focal) 3. BD(-1)	***	1. JB male (+1) 2. BD/DBC/XK/ YZM/YL(0 events)/XBC (Focal)	1. BD/YL/XK/ YZM/DBC (0 events)/ JB male (Focal) 2. DBC(-1)	1. XBC(+2) 2. BD/XK/ YZM/YL/JB male (0 events)/ DBC (Focal)	***	1. JB male/XK(+1) 2. BD/XBC/ DBC/ YL (0 events)/ YZM (Focal)

Table 1d shows the dominance hierarchies constructed from each subject POV for JB unit. 2 possible patterns of ranking and interaction (displacement) were identified, which partially correspond with the patterns suggested by the Captive groups, although the very low numbers limit the interpretative value of this data set.

1. High ranking of the male

JB male, similar to the Males in the Playground and the Caged female groups, was usually high ranking, at least in terms of displacement, where there were enough events to identify his relative position. JB male (POV, before the birth season) directed a single Displacement event each towards XBC and DBC (non nursing subadults), and received 2 Displacement events, 1 each from BD (adult non nursing female) and YL (nursing female). After the birth season, JB male (POV) was involved in one Displacement event, directed towards XBC (a nursing female). Overall, JB male was the only partner of BD (a non nursing female) from her POV, initiating a single Displacement event towards her before the birth season.

DBC (POV, before the Birth season) was involved in one Displacement event each with BD, XBC, XK, YZM and YL, and received 4 Displacement events, 1 from each of the other four females. After the birth season, when XBC gave birth, DBC (POV) received two Displacement events from XBC, and did not initiate any Displacement events.

3. Low ranking of non nursing females

It is interesting that before the birth season, the non nursing individuals, XBC, DBC and BD, were the lowest ranking, potentially suggesting that age or reproductive status may be the basis for dominance hierarchy in the wild group. YL (POV, a nursing female before birth season) was involved in 2 Displacement events, 1 directed towards XBC (a younger non nursing subadult) and 1 received from JB male; after the birth season, she was observed involved in 2 Displacement events, 1 directed towards BD and 1 received from DBC (both non nursing females). XBC (POV, before birth season) was involved in only 1 Displacement event, received from JB male. JB male directed a single Displacement event towards XBC, a newly nursing female (POV, after birth season); this was the only Displacement event for XBC POV after the birth season. YZM, a nursing female (POV, before the birth season), initiated 2 Overall displacement events, 1 towards JB male and 1 towards XBC (a younger non nursing subadult), and received Overall displacement events from JB male and YL (nursing female) only.

YZM (POV, after birth season) was involved in two Displacement events, one received from JB male and 1 from XK (an older non nursing female). She did not initiate any Displacement events.

Table 1e. Displacement events based dominance hierarchies for WRT.

Dominance hierarchy relevant events (WRT)		
MALE	**FEMALE**	**SUBADULT**
1. SA (immature) (0 events) Male (focal) 2. F(immature) (-2) 3. SA (-3) 4. F(-21)	1. Male (+11) 2. SA/SA (immature)/F (immature) (0 events) F and UF (focal) equal.	1. Male (+5) 2. SA/SA (immature)/ F (immature)/ F (0 events)/USA

Table 1e shows the dominance hierarchies constructed from each subject POV for WRT. The male was the highest ranking individual overall, usually followed by nursing females, suggesting that the presence of infants deters aggression. The only Displacement event recorded received by the UM (POV) was from females without immatures, while UM (POV) directed more Displacement events towards females than over all other age/sex classes present (SU1: $p<0.000$, df: 2, SU2: $p<0.000$, df: 1).

The only Displacement event recorded initiated by the UF (POV) was towards females without immatures, while she received more Displacement events from the male than all other Age/sex classes present; 5 Displacement events were recorded, all from the male towards the USA, (from USA POV).

Discussion

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Summary:

The aim of this study is to identify whether the individuals in a Golden Snub-nosed monkey social subunit were selecting partners to interact with at random, or showing some preference for one or more individuals over others. As in Dunbar's (1984) study of Geladas, each individual has a set of different potential strategies that they may adopt to maximize their lifetime reproductive output, and the behaviour of each monkey will reflect its selection among these alternatives. This study examined the individual social networks of the Golden snub-nosed monkey, Rhinopithecus roxellana*, to identify which of these strategies were being used. The use of multiple behaviours and levels of analysis are discussed. The results suggest the selection of behavioural event partners was potentially influenced by the hierarchy, age related aggression, deflection of aggression by the presence of an infant, the attraction of females nursing infants, similarities between subjects, and mother-daughter bonds. The results also suggest variations in the social strategies of males. The species was compared to reports for Geladas and Hamadryas baboons. Future directions for research are suggested.*

The potential benefits of having affiliative bonds - essentially, what is obtained from another individual in return for directing affiliative events towards him or her - include support given to females that the subject interacts with socially (Dunbar, 1984, Bercovitch, 1991, Swedell, 2006, Barrett and Henzi, 2001), tolerance near food sources or access to other resources (Swedell, 2006), protection from other individuals (Dunbar, 1984), enhanced ability to maintain and obtain higher ranks (Dunbar, 1984), and increased birth rates (Dunbar, 1984, Swedell, 2006); as well as reciprocation of the events, for example grooming (Barrett and Henzi, 2001). The costs of agonistic relationships include increased stress, exclusion from food sources and other resources, and decreased reproductive success. These benefits and costs have been discussed in detail in other reviews (particularly for Geladas and Hamadryas baboons: *see above references*) so the consequences of these relationships for ultimate lifetime reproductive output will be touched upon in this discussion only where relevant.

It is beyond the scope of this study to quantify the resulting benefits and costs of these relationships, but this would be a rich area of research for future studies. Instead the focus will be on the proximal causes of the exhibited social interactions (Dunbar 1984):

for example, assuming that an affiliative relationship is beneficial, why direct these benefits towards, or try to obtain these benefits from, one individual over another?

It must be remembered that the use of anthropomorphic terms in this discussion does not denote a conscious thought process on the part of the individual concerned, but is a device for convenience of discussion. Key features of some individuals' data will be examined in greater detail to assist in describing how certain social rules common to primates, in particular Hamadryas Baboons and Geladas, are being expressed by this species.

Another aspect that needs to be remembered in this study is that the preferred interaction partners reported are the ones that are most strongly represented (quantatively) in that individual's social network. This was based on the assumption that a behavioural event was equal for all individuals. It was possible that a Groom event from a male has greater "value" (for whatever reason) than one from a daughter, and therefore did not have to occur as often nor last as long, a concept slightly touched on by Dunbar (1983a), where it was pointed out that Gelada females who would rarely interact affiliatively would assist each other in aggressive coalitions, suggesting that it might not be the quantity of interactions but just the fact they were interacting.

Reports for Geladas and Hamadryas baboons have identified a number of influences or basic strategies common in either/or both species. This study identified similarities and differences between *R. roxellana* and these two species, as well as other primate species in general.

Methodological comparisons to other studies

This study relied on use of individual focal data to obtain details of the social network (POV). This had two practical implications: firstly, it allowed for the accommodation of individual idiosyncracies in the definition of behavioural events, and secondly, particularly in the case of wild populations where there can be difficulty in individual identification, it diminished the likelihood of misidentification of behaviours and individuals.

This POV approach, however, is not without limitations. An individual monkey does not exist isolated from the behaviours of other individuals; instead his or her actions are altered by the actions of others in the whole group (Seyfarth, 1976, 1977, Hinde 1983). The POV approach, compared to group scan sampling approaches, can infer these influences only by combining individuals' actions; group level analysis such as scan sampling, while it can identify greater than dyadic interactions with a higher level of confidence, requires a deconstruction of the group dynamics to infer individual actions. Theoretically, the two approaches should yield similar results, although future studies should utilize a combination of the two approaches - one that observed the individuals as single entities to establish how each subject respond to the social environment and one that utilized group level sampling, such as scan sampling, to understand how the individuals perform as components of the group. The optimum research project would be one that combined a macro analysis, examining the individuals in group, and a microanalysis, based on each individual POV, of the social environment.

Use of multiple measurements

Previous studies often used of the measure of Groom events to examine relationships (e.g. Dunbar, 1984; Sambrook et al.,1995). In this study, multiple measurements were made by scoring a diverse range of behaviours. It should be remembered therefore, that many of the studies referred to as reporting "Affiliative relationships" are referring to grooming relationships and extrapolating from them. To identify the social network of *R. roxellana*, this study utilized a three level analysis method.

Level 1: Overall relationships

The first level examined overall Affiliative and Agonistic relationships. A relationship was assumed to be represented by the combination of a number of different behavioural events; this is based on the assumption that a relationship is not influenced by the type of event, but simply that it was performed. For example: overall Affiliative relationships were represented by Single groom, Reciprocal groom, Greater body contact etc. Preferences in the relationship partners were determined, at this level, by the strength of the total of all behavioural event types representing each form (Agonistic or Affiliative). The subject with the highest number of events in each type was considered the primary preference of the focal subject (similar to Kummer 1968, Dunbar and Dunbar, 1975).

Colobines in general have been reported to have very low levels of interactions compared to Cercopithecines (Yeager and Kirkpatrick, 1998, Newton and Dunbar, 1994, Yeager and Kool, 2000), potentially in part to due to their diet (Newton and Dunbar, 1994); Newton and Dunbar (1994) also suggested that colobine behaviours were less ”visible” than those of Cercopithecines. The combination of a number of behavioural events allowed for the collection of larger datasets and thus clearer patterns of interactions to be identified.

Another benefit of utilizing multiple measurements was that it allowed for the compensation of individual differences and preferences in how they express their Affiliative or Agonistic relationships. For example, Swedell (2006) noted that while certain individuals did not seem to fit the prevailing pattern of social (Affiliative) preference in terms of grooming, they did when an examination of proximity (“sitting close”) was performed, suggesting that individual idiosyncratic behaviours are present.

Level 2: Diversity of events preference

The combination of behavioural events to create the overall relationships used in the Level 1 analysis was based on the assumption that all such events were equal - in essence, that a Single Groom event represented the same “social value” as a Greater Body contact event. Each behavioural event requires a different amount of time to be performed (*see Appendix for examples of Behavioural event durations in ZNNR*), and potentially involves different energy expenditure; thus it would seem unlikely that each behavioural event type had the same value as a social event. To accommodate this, the second level of analysis was used. The second level of analysis was performed on each event type singularly, Single groom, Reciprocal groom, Chase etc, and identified the most common behavioural event partner from each individual POV. This level of analysis identified the individual in the social network with which focal monkey interacted the most, across the widest range of behavioural events. Of course, these divisions into single events types resulted in much lower data sets for analysis and statistical analysis, such as undertaken at Level 1 were not always possible.

Level 3: Meta-behavioural categories

The third measure relaxed the definitions of certain behavioural events to create 3 Meta-behavioural events: Overall groom, Overall body contact and Displacement events. The selection of these three Meta-behavioural events was not random.

- Each was selected for high level of similarity between the constituents: For example, Single groom and Reciprocal groom (Overall groom), Greater and Lesser body contact (Overall body contact), or Approach (run)-retreat and Approach (walk)-retreat (Displacement).
- Overall groom events were also selected because of their prominent use in studies of primates to identify social relationships (for example Sambrook et al., 1995) and the theoretical relationship with social bonds (Seyfarth, 1983, Gouzoules and Gouzoules, 1987).
- Overall body contact events were selected because, by widening the definition, a large group of behavioural events come under the umbrella, large enough to allow for statistical analysis in some cases.
- Displacement events were selected for two reasons. First, because they were the group of Behavioural events that could be considered the clearest *directional* Agonistic events (with defined roles of aggressor, initiator, and recipient, throughout the entirety of each behavioural event's occurrence). Secondly, Displacement events could be used as the base data for identifying the dominance hierarchy in each of the social unit (Seyfarth, 1976, Rowell, 1966).

The combination of all three levels of analysis gave a more precise measure of the social networks than any one measure, as each level could and did act as a confirmation of the other levels. In general, with slight variations, analysis at all three levels gave similar results for each individual dataset, suggesting that the sociogram constructed for each individual gave a good representation of the social network from that individual's POV.

Compounding and interaction of factors:

This study identified a number of possible influences on the selection of behavioural event partners in *R. roxellana*. A number of the potential influences may not have been autonomous, nor were they exclusive. For example, BBBG of the Playground group exhibited a low level of female-female compared to female-male interactions; this could be because she was not nursing an immature, as the results have suggested that there is an attraction to females with immatures, or because she did not have any kin, as kin relationships are attractive also. BBBG's ranking was low, and this could have been because she did not have any strong Affiliative relationships with more dominant females, or conversely she may not have had any strong Affiliative relationships because she was ranked so low.

Some of these compounding factors could be separated by comparing individuals who shared only a subset of each other's traits. For example, in some cases the mother-daughter bond appeared to be very strong (it constituted a larger proportion of total behavioural events than did those with non-kin) and reciprocal, whereas in others it was not. In this case, the presence of immatures appeared to enhance a mother-daughter bond. SF and BBSG (Playground group) both exhibited a reciprocal Affiliative relationship and both were nursing, but in other mother–daughter dyads, where only one individual was nursing, the relationship seemed more biased towards the non-nursing individual directing affiliation to the one who was nursing. Some of these "separation" comparisons have to be cautious, however, as there might be differences between the two groups being compared that could also have some influence (for example the age difference of the offspring that were being nursed).

Another example would be whether the *R. roxellana* male potential preference was for young females or females with immatures. This can be determined by comparing OMU preference for SF (young and with an immature) with his lack of interest in NSF (older and with immature), and JB male's preferences (before birth season) for XBC and DBC, both younger and without immatures, suggesting that male attraction stems more from age related issues than from reproductive state. This interpretation was not conclusive as after the 2006 birth season, JB male's preference was YZM, an older female without an immature. This suggests that the pattern of preference for an individual cannot be identified by a simple *exclusion* protocol (i.e. one influence per social situation).

The complex interaction of different influences is a common issue in primate studies. Seyfarth (1976), for example, suggested that while giving birth will enhance a female's social standing (making her more attractive as a partner), the level of change that results is dependent on the hierarchical position that she previously held. Seyfarth (1976) and Kapsalis (2004) pointed out that rank and kinship are often correlated in many species; while it was difficult to identify the hierarchy in the present species, the potential for this and other influences as compounding factors must be considered, particularly in future studies involving a larger number of individuals.

The influence of the hierarchy:

Studies have suggested that, in some primate species, position in dominance hierarchy reflects the types of relationships and the roles, and even which individuals a monkey interacts with (Seyfarth, 1976, 1977, Dunbar, 1982, Gouzoules and Gouzoules, 1987). High ranking individuals are more attractive Affiliative event partners than low ranking individuals (Walters and Seyfarth, 1987, Seyfarth, 1976), and high ranking individuals are the recipients of a lower number of Agonistic events.

A high rank in a dominance hierarchy has numerous benefits, as discussed by Chapais and Schulman (1983), and interacting with high ranking individuals can result in the transference of some of these benefits. A subject that, for example, grooms a higher ranking individual has the opportunity to bond with the latter and, through reciprocal support in future Agonistic events, increase its own ranking (cf. Parr et al., 1997), or through being tolerated near food items may gain access to increased and better quality foods. The effect of attraction of ranking, however, while a common feature in many primate species, is not found in all species and populations (see Walters and Seyfarth, 1987).

The existence of a dominance hierarchy among females has been recorded for a number of colobine species (Yeager and Kool, 2000 and studies therein), though not in many reports based on fieldwork (Newton and Dunbar, 1994). Yeager and Kirkpatrick (1998) suggested that Asian colobines do not exhibit dominance based conflict over food access, and it may be that some colobine species exhibit only poorly developed hierarchies, as reviewed by Struhsaker and Leland (1987). Such tolerant and egalitarian social systems usually do not have strong dominance relationships, at least not linear ones that are easily measured (Sterck et al., 1997).

Aggression, while often related to the acquisition of resources, is also utilized in the establishment and maintaining of dominance relationships (Walters and Seyfarth, 1987). This study attempted to produce a dominance hierarchy for each social unit based on a simple displacement rule of ranking, similar to the one described by Rowell (1966), in that higher ranked individuals would displace lower ranked individuals more often than the other way around. It was difficult to develop a working model of the hierarchy in the present species; the hierarchy seems variable in some cases, with rank position reversals occurring depending on which subject's POV was used.

Colobines are not as aggressive as other nonhuman primates, although colobine males are more aggressive than females (Poirer 1974), and *R. roxellana*, like other colobine species, is characterized by a low level of aggression (Ren et al., 1991), so the dataset for developing the hierarchy was not large, and these discrepancies could simply be a result of this. Alternatively, even though a dominance hierarchy was difficult to develop, this does not mean one was not present; the method of measuring may have been too crude to describe it clearly. In his first study, Dunbar (1983a) was not able to conclusively identify a dominance hierarchy in Geladas, but later studies identified the presence of one in a number of social groups - albeit they were subtle and required little maintenance – and, beyond this, the apparent hierarchies were crucial in explaining key issues about the species' social behaviour (Dunbar 1983a).

A second issue is that the hierarchy was based on Displacement events (Approach (walk)-retreat, Approach (run)-retreat and Chase events), which are Agonistic events and form a part of individual Agonistic event tallies. Thus examining the direction of Agonistic events in terms of the hierarchy can be self-fulfilling, as some of the Behavioural events are in fact what defines the ranking. Taking this into account, it is still worth looking at and examining it, to identify whether there is any evidence of an influence of hierarchy.

Overall, there were patterns identified throughout the datasets for all the social groups that could be cautiously interpreted as representing, if not a hierarchy, at least a basic consistent dominance-submissive relationship among the subjects. Agonistic events were usually directed down the hierarchy (including non-displacement based behavioural events), while Affiliative events, in particular Groom events, were only loosely based on the hierarchy and often went against the ranking. This would suggest that the directionality of Agonistic events was much stricter than that of Affiliative events. This is similar to Hamadryas baboons where the pattern of affiliation (grooming) did not seem to reflect the distinct dominance hierarchy (Leinfelder et al., 2001).

Both the Playground and Caged female group exhibited apparently stable hierarchies. It appeared that females without infants were ranked lowest for both groups, and mother-daughter groups highest in the Playground while older individuals were higher ranked in the Caged female group. Overall, when present, the male was the highest ranked in both groups. Agonistic events were rare in the wild group, although the hierarchy did appear to have some influence on the direction of aggression.

Recipients of aggression:

In Geladas and Hamadryas baboons, Agonistic events are rare (Stammbach, 1987), and the overall aggression rate in *R. roxellana* also appeared low (Ren et al., 1991); reconciliation was common, and there appeared to be symmetry between the two involved (Ren et al., 1991). Aggression is an important component of primate social organization (Sterck et al., 1997). Group living offers many benefits, but the individuals with which a subject interacts can also be their primary competitors: the main expression of this competition is aggression (Walters and Seyfarth, 1987).

For individual *Rhinpoithecus roxellana* the amount of aggression received may be dependent on a number of factors: age, kin relationships, ranking, reproductive state, and relationship with the male. For younger individuals, group living offers protection and an opportunity to acquire skills from the older individuals. On the other hand, there is a cost in the form of age-dependent aggression, as younger individuals usually receive more aggression. An age related hierarchy in terms of Agonistic events seems to be present in both Geladas and Hamadryas baboons (Colmenares, 2004). A relative can sometimes offer support and act as a shield from other group members' aggression. The presence of an immature, or whether the female in question is nursing, can lead to a decrease in aggression; generally, nursing females receive fewer Agonistic events in primates (Seyfarth, 1976). The presence of the resident male may also divert aggression (possibly seen in the Playground group: *See below*), as *R. roxellana* males have been known to perform a mediating role in female-female aggression (Ren et al., 1991).

As Walters and Seyfarth (1987) pointed out, the use of frequencies of Agonistic events may not truly represent the aggression in a relationship, particularly if the two individuals concerned interact a lot more than others. A proportion of the Agonistic events received by the females in this study were from matrilineal relatives and/or individuals with whom they had a strong Affiliative relationship as well.

Throughout this study, the recipients of aggression were usually the youngest, except for SF. SF's mother was present, and it has been suggested that in some primate species close matrilineal relatives will protect an individual from others' aggression (see above); but the other recipients of Agonistic events, such as OG, OBN, XBC and DBC, all had mothers present, and much came from individuals other than the mother, though few exhibited the strong mother-daughter relationship of SF and BBSG. SF was nursing, as was XBC after the 2006 birth season, when the pattern of aggression which she received changed. It is possible that the presence of the immature deflected aggression (as reported by Seyfarth, 1976).

SF also exhibited a strong relationship with the unit male; there was no male present for most of the time in the Caged female unit, in which the youngest was the most common recipient of aggression. In captive colonies, it has been found that the male will often intervene as a pacifier in female conflicts (Ren et al., 1991). The function of males in the one male units of *R. roxellana* may not be limited to the ability to defend the females from other males. Ren et al. (1991) speculated that the behaviour of males intervening between female interactions, in captive breeding groups of *R. roxellana*, was the role of the male in the wild; in 93.6% of these conflicts, an adult male would play a mediator role and intervene with appeasement and reassurance behaviours to both parties. It is possible that, unlike a Hamadryas baboon male that will herd the females away from other males and other groups, the male in the one male unit of colobine species uses intervention and reconciliation to maintain group cohesion, as in Geladas where, though fights between females are rarely interrupted by the male, he does use Affiliative events to maintain unit cohesion (Mori, 1979).

While the present data suggests that the presence of a strong relationship with the male, in both captive and wild populations, may in some way deflect aggression away from younger individuals, this may not always be obvious. Two of JB male's most prominent Affiliative relationships before the breeding season were with XBC and DBC, two subadult females who were young and without infants (like those in the Caged female group), both of whom received a large amount of aggression from others, suggesting that the male's presence is not always a deterrent.

In the Playground group the most likely recipient of aggression was the second youngest non nursing female without kin present (BBBG). In the Caged female group, only one had no adult kin present; she was an older female but, unlike BBBG, she was also nursing. It appeared that younger non-nursing females were the recipient of the group's aggression. None of the females showed a prominent Affiliative relationship with the introduced male.

In JB unit, Aggression appeared to be directed towards younger individuals and females without immatures. Even though the recipients' identity shifted with the new birth season during the data collection period, this criterion did not.

Attraction of females with immatures:

The presence of an immature has been reported to affect the dynamics of relationships in many social primate groups: females with immatures appear more attractive as partners and receive more Affiliative events (Walters and Seyfarth, 1987, Seyfarth, 1976), sometimes even over kin (see below). Reports suggest that females with offspring (or are lactating) are groomed more and by a greater number of individuals; Seyfarth (1976, 1977) described numerous studies where the birth of a new infant altered the grooming relationships, and suggested that any attempt at explaining the social (grooming) networks in primates would have to take this influence into account.

In this study there were five subgroups of "Nursing" females. For JB unit, the birth of two new infants also coincided with the maturation of the two subadults; Dunbar (1983a) suggested, for Gelada baboons, that the demographics of a group can alter the expression of the Affiliative preferences. In the Playground group, BBSG, SF and NSF were nursing/weaning three youngsters, born the previous year, while SHM and

BBBG2 in the Caged female group were nursing young born earlier in the same year. In JB unit, there were two females nursing infants in 2005, YZM and XK, who entered the young juvenile class after the birth season of 2006 when XBC and YL produced infants.

The final group consists of subjects that interacted with the focal age/sex category representatives, who were not individually identified in the Western ridge troop (the same troop that contained JB unit); these were identified as simply nursing/embracing immatures (infants and young juveniles). Males were very rarely identified interacting with the immatures, so their data were not divided up (although apparent infant care by the male was observed).

Females with immatures were more likely to have reciprocal female Affiliative partners: SF and BBSG, XK and YZM, for example, whereas non-nursing females such as BBBG and BD would direct Affiliative events towards them without reciprocation. The fact that a bond between nursing females can sometimes alter the mother-daughter bond was less predictable, however. The bond between mother and daughter appears to be more prominent when both of the females involved are nursing; when only one is nursing the events appear biased towards the nursing female.

It is possible that Groom and other Affiliative events with a nursing female are aimed towards gaining access to her immature (Barrett and Henzi, 2001). In most colobine species, alloparental care appears common (Yeager and Kool, 2000), and in *R. roxellana* the infants are said to be often passed between females (Poirer and Hu, 1983). Some potential alloparental care was seen in this study, although it predominantly consisted of an individual grooming the immature as the mother held it. Interestingly, OMU, the male of the Playground group was documented on a number of occasions to not only embrace the immatures but also to carry them.

Alloparenting has a number of benefits for both subjects, benefits that are enhanced if it is kin that are involved. Yeager and Kool (2000) reviewed a number of studies and described the benefits of alloparenting: these included allowing the mother time to feed, social integration for the infant and improved parental care. On the other hand there are also benefits for the female that offers the service, such as acquiring parenting skills, and deflection of aggression.

There is also a potential cost to allogrooming in the form of infant abuse; this could be adaptive for the female giving the alloparenting, whether intentional or not, as it removes a competitor. This can be a danger particularly for females with little or no nursing experience; in the Caged females group, some of the non-nursing females were young and inexperienced, and they were often seen trying to obtain possession of recent infants from their mothers, who appeared reluctant to have the infants leave their possession (pers. obs.). This may have influenced the two nursing females to interact more with each other, to avoid the potential negative impact on their offspring. In JB unit it was only after the 2006 birth season, when new infants were present, that the nursing females from the previous season appeared to relax their preferred behavioural patterns with other females with infants, and other relationships could be expressed (though the age of the immatures needs to be considered as well).

Seyfarth (1976) observed a similar pattern in Hamadryas baboons and suggested (based on other studies) that relationships with lactating females' social partners were different from those when they were not nursing. For Geladas, however, the presence of an infant would not alter the documented relationships (Dunbar, 1983a); even the birth of a new infant was not a source of change in the group, but this could be because it was usually the closest mature kin that interacted with the newborn and the mother, who would be interacting with her (the new mother) anyway (Dunbar, 1979).

In the Playground group, nursing females represented a much more attractive type of individual to interact with affiliatively than others, even to the point of distorting the mother-daughter bond. In the Caged female group, in contrast, the two infants were born only shortly before the start of the observation period, yet females with immatures were still preferred Affiliative partners, and this could at times distort certain aspects of the mother-daughter bond.

JB unit offered an opportunity to compare whether the presence and age of an immature alters the attractiveness of the nursing female. Before the birth season there were two females with infants; after the birth season these became (borderline) young juveniles, and two other females changed their reproductive status in 2006 when they gave birth to infants. A lot of the data relevant to this section also pertain to other sections (for example, attraction of like and mother-daughter sections) and are presented there.

The data collected on unidentified individuals in the Western Ridge Troop suggested that other females, particularly those with immatures, were the most likely overall recipients of Affiliative events, although this was not reciprocated; hence, while females with immatures are attractive for grooming (and Affiliative events overall), those without immatures might not be (the UF category was a combination of females with or without immatures, whereas the F (immature) consisted solely of nursing/carrying females). This pattern was seen across the broad range of Affiliative events as well.

Attraction of like

Individuals who are in the same age/sex class or reproductive state will have similar demands and requirements. A common need can be the basis for Affiliative relationships (such as a coalition to obtain or protect a resource), or an Agonistic relationship if they are in competition for a limited resource.

The possibility that the social relationships expressed by the *R. roxellana* groups studied here were the result of an adherence to a simple rule, “like attracted to like” (rank, age, reproductive status etc), appeared to find some support in this study. The data obtained from JB unit were the most useful to illustrate this rule of attraction: individuals did appear to alter their preferences as the level of congruence between their conditions increased.

Individuals of the same age group showed a preference for each other, particularly the younger aged “groups” (for example: XBC and DBC, OG and OBN), and nursing females appeared to interact preferentially with each other. This may be in part a matter of convenience rather than a “conscious” selection. For example, females with immatures have higher energy costs, and so may be less flexible in their behavioural patterns; nursing females might be performing similar actions at similar times so putting them in close proximity, or they may be together in safer places because of danger from predators etc to their infants; they might therefore be interacting with each other out of default rather than preference. While not limited by the energy demands of nursing, younger females may experience different forms but similar types of restrictions on their actions.

The data for NSF suggested a preference for BBSG; as both females were nursing, this could be interpreted as support for "like attracts like". SF (from NSF POV), however, directed the least number of Affiliative events towards NSF, even less than towards BBBG (the only female without an immature), and from SF POV she received no Affiliative events from NSF. This suggests that if there is an influence based on the attraction of "like", it might be a combination of characteristics (such as both age and reproductive state) rather than simply one matching feature. Also, overall, the number of deviations from what would be expected does suggest that this rule's impact is overshadowed by other rules of engagement, such as kin selection.

In the Playground group there were three females who were nursing and this appeared to equate to an increase in Affiliative events between them, compared to interactions involving the female without an infant and the unit male. The bond between mother and daughter also appeared to be enhanced when both of the females involved were nursing.

In the Caged female group, the females could be grouped into separate categories according to age and reproductive state. The results suggest a common trend for individuals in the same category (age or reproductive status) to interact preferentially, although it was certainly constrained by other influences.

While in the Caged female and Playground groups there were older and younger females, they were all still mature; in JB unit, however, there were two distinct age classes, adult and subadult females. The division based on age therefore becomes more a relevant measure. Subadult females are morphologically distinct from adult females; especially, they are much smaller and are not reproductively active (though mountings with the male did occur), and this division could also be used to examine whether there is variation on that level. The results suggest that there is a common trend for individuals in similar reproductive condition to interact preferentially. Age class might have also had an influence, as the birth season coincided with the maturation of the subadults in the JB unit. Neither of the potential mother-daughter dyads showed the strong relationships seen in the captive groups, until the subadults matured and the mother-daughter relationships became more noticeable.

The data on unidentified individuals in the Western Ridge Troop showed that UF's preferences for Affiliative events were other females - predominantly females with immatures - though she received more events from females without immatures compared to USA and UMs.

Male choice:

The male's relationships with the females in his social group potentially categorize the social system exhibited by a species. As discussed in the introduction, the type of male-female relationship exhibited is one of the key differences between Hamadryas baboons and Geladas. The presence in the *R. roxellana* social subunit of overlapping matrilineal generations would suggest that the cross-sex relationships exhibited should be more similar to Geladas than to Hamadryas, with strong female-female bonds overshadowing the relationships with the male. Nevertheless the resident male would be a theoretically attractive partner. The species exhibits strong sexual dimorphism, though it exists in Geladas as well. Access to the male means access to fertilization, a potentially contested resource among females, who have been reported to disrupt other females' solicitations of the male (Ren et al., 1995). Males have also been reported to be involved in the protection of young (Rapaport and Mellen, 1990, Zhang et al., 1999b) and the male is the dominant in the hierarchy.

The one male-multi female social system with matrilineal bonds is often characterized by relatively short male tenure (Dunbar, 1983c), and tenure length was a deciding factor limiting the value of the male as a coalition partner in Geladas (Dunbar, 1984). While the tenure length for a *R. roxellana* male is still being researched by GSNM (see recent publications by this group), if it is similar to that of other primates with similar social structures its brevity would diminish the male's appeal as a partner. Despite this, for some females, for example those without kin, the male may be the best option (Dunbar 1984, 1983c).

In Geladas, the females that groomed the male the most were those without relatives (Dunbar 1984), and the male's preference was for the highest ranked female without a partner (Dunbar 1984). The alpha female could monopolize the male, but prefers other females (Dunbar 1983c).

In Hamadryas baboons, the male is the recipient of most of the unit's Affiliative events, although this has been partially challenged in recent years (Swedell 2002, 2006). Swedell (2006) found that that there was a considerable degree of variation in the amount of interaction each female has with the male, and females spend more time with each other than expected in the cross bonding model (Swedell 2002). Hamadryas baboon males appear to spend more time in the proximity of females who are receptive (oestrus) (Kummer 1968).

R. roxellana males, in this study at least, showed a surprising level of variation in their social relationships: this might be a result of the different conditions each group experienced, as may be the case for Geladas as well (Dunbar, 1984, Lee, 1983, Swedell, 2006). Dunbar (1984) commented that variations reported for Gelada males might be the result of not having the opportunity to take the best strategy; in essence each of the preferences recorded is a compromise under different constraints.

In the Playground, the preference of the male for was nursing females, whereas in JB unit the preference focused on non-nursing females. There were slightly more adult members in JB unit than in the Playground; in Geladas and Hamadryas it has reported that size and demographic variation in the social group can influence the male's social interactions (Swedell 2006, 2002; Dunbar 1983a, 1984).

In the Playground, BBBG did not have any close relatives, neither did BD in JB unit (known in the case of BBBG, presumed in the case of BD based on records kept), and ranked low in the hierarchies of their social units. Both these females' preferred Affiliative event partners were their respective males, from each of the females' POV. In Geladas, the pattern is similar, in that the male is reported to interact with the lower ranked females, usually those without mature kin. From JB male POV, his preference for XBC cannot be explained in this way, as although she was low ranked her mother was present; a possible explanation is that neither XK (XBC's probable mother) nor YL (who might possibly have been XBC's mother) directed affiliation to XBC, so functionally she might be considered "kin-isolated". Perhaps, those without strong kin ties are more likely to emigrate, so the male dedicates more Affiliative "time" to them to avoid this loss of a group member; in the Playground group, the potential for immigration was much lower (the only other group present in the comparatively small area was an All male unit), so OMU selection of Affiliative partner was not so constrained (see below).

The question of infanticide

In the Caged females group, the newly introduced male interacted very little with the females; the interactions that did occur were predominantly with non-nursing females, in particular WC. The two nursing females, SHM and BBBG2, rarely interacted with the male at all. One could interpret this as a strategy to avoid infanticide by the new male. *R. roxellana*'s high level of sexual dimorphism and one-male social system can be extrapolated to a high likelihood of infanticide (Janson and van Schaik, 200).

There have been two reports of infanticide by males in captivity at the Beijing Breeding Centre of Endangered Animals (Zhang et al. 1999a), although this has not thus far been confirmed in wild populations. Both cases of infanticide did involve the introduction of a new adult male, but another male was successfully integrated into the same group and did not commit infanticide (Zhang et al. 1999a). It has also been documented in a number of other colobine species (see studies cited in Struhsaker and Leland 1987 and Newton and Dunbar 1994). Xiang and Gruter (2006) described an infanticide event within *R. beiti*, followed by the male's consumption of the remains. A number of possible functions for infanticide have been proposed and reviewed (see Poirer 1974, Struhsaker and Leland 1987, van Schaik, 2000 for details). New male leaders in OMUs are unlikely to be related to infants already present (Struhsaker and Leland 1987), and no other males are present to defend them. In relation to this, the fact that SHM and BBBG2 of the Caged female group spent a lot of time away from the male and rarely interacted with him potentially makes sense.

Emigration

The male in JB unit was the assumed sire of the infants, and resident of the unit for a number of years, yet his preferences were similar to those of the introduced male in the Caged females group - to interact affiliatively with non nursing or young females, presumptively a response to the danger of dispersal. While not common, it is also not unknown in some colobine species for single females to disperse from their natal unit. JB unit was part of a much larger troop, XBC and DBC had just matured, and BD had no relatives in the group. Studies in Geladas and Hamadryas suggest that these three individuals might be the most likely to emigrate from the social group. Lower ranked Geladas (though in the study cited none of the females were related to each other either) and younger female Geladas are more likely to desert their male; the likelihood of a female remaining with male increases with increased positive social interactions (grooming) with him (Dunbar,1984).

Dunbar (1984) suggested some alternative strategies for the male to avoid desertion by females: grooming low ranking as opposed to high ranking, or younger as opposed to older females, or grooming whichever member of each dyad is more likely to desert. The importance of the male in maintaining the unit cannot be ruled, out as his continual preference for younger individuals may assist the cohesion of the group.

The data from the Playground group show a preference by the male for the nursing mother-daughter dyad, BBSG and SF, even though for some of this time (before the removal of NSF) this preference was not reciprocated. The male showed very little Affiliative interest in females without immatures.

An attempt to introduce the male was made during the course of the observation sessions with the Caged female group. This meant that the data were collected under disjointed and alternating conditions, periods with a male present and periods with a male absent. Geladas have been reported to remain together in the absence of a male, while Hamadryas baboons have not. In both species, males who are attempting to join, or take over, a group of females will often first try to create Affiliative bonds with the lower ranked females or females without infants. A similar pattern of behavioural events was seen in the periods where the male was given access to the Caged female group.

In terms of male residency, JB unit had more in common with the Playground group than the Caged females group, in that the male had been present for a number of years and was therefore a stable component of the social network. In the Playground group the likelihood of emigration by the females was much lower (the lack of other One male units to join) than for JB unit.

Female-female relationships: Mother-daughter relationships

Kin selection is an important tool in explaining the social strategies of primate species. The Inclusive Fitness concept (Hamilton, 1964a, b) and its implications appear to describe and correctly predict a diverse range of social behaviours (Strier, 2003). For Cercopithecines, kinship (particularly matrilineal) is a principal influence on the social network (Kapsalis, 2004), and it is likely that kin preference might be a shared trait in all primates (Dunbar, 1979). A common expression of kin preference, and one that can be tested for in this study, is the mother-daughter bond.

For lower ranked females, making an alliance with higher ranked members of the social group can be beneficial. Coalitions with higher ranked individuals can raise the rank of a lower ranked individual (Dunbar, 1984, Strier, 2003) particularly between mother and daughter (Koyama, 2003), as well as other benefits. Thus bonding with the mother makes sense, from the daughter's POV, since the mother is usually higher ranked (though some species, particularly ones characterized by high levels of aggression in younger individuals, may have younger individuals ranked higher than older, such as Chimpanzees: Walters and Seyfarth, 1987).

From the mother's POV, a coalition can also be beneficial. For example, in Geladas a coalition even with a lower ranked individual can assist a female maintaining her rank for longer (Dunbar, 1984). While any coalition is better than none, a relationship with a lower ranked individual has fewer potential benefits than one with a female of equal or higher rank; in Geladas, for example, coalitions do not increase the ranking of the dominant (prime aged) female, only of the lower ranked individual (Dunbar, 1984).

Relatives share at least some of the same genes, and Affiliative bonds between them can result in reproductive enhancement via inclusive fitness (Dunbar 1984). As genetic relatedness declines, a decreasing number of Affiliative events can be predicted, towards a "kinship threshold" as described by Kapsalis (2004), because, as the relatives become more genetically distant, there is a corresponding decrease in the inclusive fitness benefit (see Hamilton, 1964a, b). Siblings and offspring are the two closest kin and thus represent the greatest benefit. A son or brother of mature age is rarely present because males in *R. roxellana* disperse, so it is only among females that there is the opportunity for kin selection. Relationships outside the OMU boundaries have not been studied in enough detail to know whether there are between-group bonds as seen in Hamadryas baboons. A sister potentially already has a position in the social hierarchy, all else being equal; an older female in her prime will be higher ranked than a newly matured female (the daughter). In this study, the only individuals known for certain to be full sisters were pairs of immatures. Other studies have suggested that a mother-daughter bond is stronger than a sister-sister bond (Dunbar 1984), and more attractive despite the benefits of support by a potentially higher ranking sister. Part of the reason for this is that, since most matrilineal primate species have a fairly regular turnover of males, the likelihood of sisters being paternally as well as maternally related is low, for Geladas at least (Dunbar 1984). In JB unit, however, JB male was the presumed sire for a number of pairs of sisters (juveniles and infants during the course of this study), so that adult full-sister pairs would be theoretically possible in the future.

When all else is equal a monkey is expected to assist the relative that will result in the greatest increase in its inclusive fitness (Chapais and Schulman, 1983). The increase in fitness received by assisting an already established sister would be lower than the increase received by assisting the offspring, although the value of the reciprocal benefits from a mature and better skilled individual compared to a younger inexperienced daughter might offset some of this.

A second factor might be "youngest ascension": the controversial claim that the youngest offspring occupies a rank just below that of the mother but higher than that of older siblings or other individuals who are subordinate to the mother: a position that potentially could not be obtained by the daughter without assistance (Koyama 2003; Strier 2003; Kapsalis 2004 and articles cited in). One of the reasons for this is presumed to be that the youngest is the optimal return on the investment (Kapsalis 2004).

Dunbar (1984) compared the reproductive output gain of different relatives in Geladas with the assistance of kin - sisters versus daughters for example - and established that the average benefit received was maximized when assisting daughters. Dunbar (1984) also tested the different strategies of coalition partners including daughter, sister, aunt etc, versus male, to identify the best partner, at different points in a hypothetical female's career; overall mother-daughter was still the preference. Even across the entire life span, although the values of each potential partnership did vary, the mother-daughter relationship was still the most preferable.

Another consideration is that a female may transfer her support from her sister to her own daughter on maturity (Dunbar, 1984). Thus like males, whose shorter tenure decreases their attraction, sisters despite their genetic relationship may be an attractive partner only for the short term.

Colobine species, in general, live in groups of related females, a common pattern in Old World monkeys (Newton and Dunbar, 1994). These matrilineal groups exhibit strong female bias in the social unit, such as the one male / multi-female social units seen in *R. roxellana*, and vagrant males live either solitary or, as in case of *R. roxellana*, in all-male groups (Newton and Dunbar, 1994). For the majority of matrilineal colobine species, female bonds are the basis of the society, with males having little intrasexual interaction (Newton and Dunbar, 1994).

Geladas bisexual groups are matrilineal and have strong affiliative preferences between kin, particularly between mothers and daughters (Dunbar, 1982, 1983b, 1984), and females rarely interact with individuals outside their immediate matrilineal line (Dunbar, 1983b). Females without kin, as potentially in the case of BBBG (Playground group) or BD (JB unit), become socially peripheral to the rest of the females in a group, just as in Geladas (Dunbar, 1984). In Geladas also, females without relatives, or who cannot form coalitions with other females, prefer the male as a partner (Dunbar, 1984).

Hamadryas baboons have not been reported as exhibiting this pattern of mother-daughter preference (Leinfelder et al., 2001), as would be expected for a species whose groups are generally non-matrilineal, though recent reports suggest that this may not be so (Colmenares, 2004). While some articles suggest that there is potentially some kinship attraction (articles cited in Colmenares, 2004), the overwhelming influence is the male-centred affiliative social network. In fact, Seyfarth's (1977) modelling of Hamadryas social interactions suggested that genetic relatedness had little influence over the grooming patterns exhibited.

In this study, all three one-male units showed strong mother-daughter bonds, as seen in the overall Affiliative relationships as well as in the other tests, though with slight variations. It also appears that events such as reproduction, maturity, and male introduction may enhance this kinship bond. The Playground group contained only one known mother-daughter pair: SF and BBSG. While each exhibited an Affiliative relationship with the other, the relationship seemed to be more prominent in the Daughter's POV of the social network than the mother's.

There were two mother-daughter dyads in the Caged females group. One of these consisted of OBN and WC, two females who were not nursing; here, the relationship appeared to be important and reciprocal to both individuals, though possibly more important to the mother than the daughter, and both exhibited strong affiliative bonds from either individual's POV, with and without the male present.. The second consisted of a dyad where the mother (BBBG2) was nursing and the daughter (OG) was not; this relationship seemed to be more prominent in the non-nursing daughter's POV of the social network than the nursing mother's, with an apparently strong daughter-initiated Affiliative event bias.

In JB unit, there were two potential mother-daughter dyads, though the situation was a little more complicated because of the potential for misclassification - it was possible that YL was DBC's mother and XK was XBC's mother. YL exhibited a strong bond with DBC, both before the 2006 birth season, neither was nursing, and afterwards, when both were nursing. DBC's preference for XBC before the birth season, when both were subadults and neither nursing, shifted to YL upon maturity. XK on the other hand did not exhibit an exceptionally prominent relationship with either subadult before or after maturity/birth season.

The age class of the individual may also have some influence, as the 2006 birth season coincided with the maturation of the subadults in the JB unit; before this, neither presumed mother-daughter dyad showed the strong relationships seen in the captive groups.

It should be noted that, in the data collected when XBC was the focal subject before the birth season, there was a large number of Affiliative events involving unidentified individuals. This may have included XK, her potential mother (considering that females are more likely to be listed as "unidentified" compared to the male). This limits the interpretative nature of the events before the birth season from XBC's POV.

Effects of stress

A changing environment, whether it is the result of the loss of a potential partner, the introduction of a potential ally or threat, or the changing reproductive status/maturation of members of the social group, can alter the value of an individual as a potential partner in interactions. Three different "stressful events" occurred during this study:

The stressful event in the Playground group was the removal of NSF. NSF was not the preferred affiliative partner for any other female, though BBSG was hers. From that perspective, the loss of NSF might not have been expected to alter the social network; nevertheless there was a dramatic change in some of the Agonistic and Affiliative event preferences for some of the members of the social unit.

The stressful event in the Caged female group was the introduction of a new male at certain times throughout the observation period. For the majority of the time the Caged female group was without a male. The introduction of a male offered an increased range of interaction partners: a male can be a valuable partner, but there was also the danger of infanticide as the Caged female group contained two new born infants, not sired by the introduced male.

The stressful event in JB unit was the maturation of two subadult females and the birth of two new infants. The birth season for this species in the area of the study was early in the year, and this period coincided with a shift in the demographic structure, as two subadult females became adult, and one of them also gave birth, as did an older female.

Of the three "stresses" examined here, it appeared that only the removal of a group member and birth/maturation resulted in a clear change in the pattern of behaviours, while a number of other relationships (mother-daughter, male-younger females, etc) were present both before and after the respective "stress" event.

It appears that different forms of stress result in different changes to the social network. After the stressful event of the breeding season, JB male's Affiliative preference had shifted to YZM, a female without an infant and no other female's preferred choice, but this "shift" still followed the same criterion of selecting partners who were not nursing.

In the Playground group, OMU's preferences were BBSG and SF (nursing), both of whom, after the removal of NSF, shifted their Affiliative preference to him. This may be due to the differing characteristics of the two "stress" events: the mating season, maturation and birth are predictable, unlike the removal of a troop member (a possible simulation of predation or death). This is combined with the fact that NS, a male in the AMU housed with the Playground group, had just matured and was interacting comparatively more (but still a very low amount) with the Playground females, so the larger and more aggressive male may have represented a better choice of partner.

In Geladas, a male does not have much influence on the dominance ranking or social interactions of the females; in *R. roxellana*, in the 2 social groups with well established males, the males' preferences for low ranking females would suggest that, in this species also, males have little influence on female ranking.

In both Hamadryas and Geladas, the maturation of an individual can alter the social relationships (Dunbar, 1983a), but social changes such as births have little impact on the social network of Geladas according to Dunbar (1979). For *R. roxellana*, births and maturation both altered the *selection* of partner by the male in the social network, as seen by the shift in preference of JB, but not the *premise* for that selection (the reason why he selected who he did).

Dunbar (1979) found that death of a group member did not alter the group dynamics of Geladas; whereas in this study the "death" (removal) of one of the females resulted in a shift of Affiliative event preferences towards the male. This might have been affected by the size of the groups: in the Playground group there were only four females, while the number of dyads in each social group in Dunbar's (1979) study suggests that the groups were much larger.

AMU - a special case:

The OMU of the Playground group shared their enclosure with an All male unit (AMU) that consisted of 3 males. One of these males was born in the wild, two in captivity. One of the captive-born males, designated NS, was an older subadult nearing maturity at the time of the study at SWAP.

AMUs are a poorly researched type of social group in many primate species, particularly Colobines. This AMU showed strong Affiliative event preferences, exhibited at all levels of the analysis, and dominance relationships, as predicted by Kirkpatrick (1998). Interestingly, the outcomes of the dominance relationships did not appear to be based on age or size. ST was the oldest individual yet was the lowest ranked; while S was older than NS, and outranked him. ST was considerably older than S/NS, but only one year older than OMU who still maintained a female harem in close proximity to the AMU. The relationships also did not appear to be based on size, as ST was much larger than either S or NS.

The presence of preferred interaction partners does suggest that the males are not randomly selecting their associates. Many species will form coalitions between males to take over a social group containing females, and identifying the influences of attractions between these individuals may be a rich area for future research.

The loss of NSF did not coincide with any alterations in the relationships in the AMU though S did start to reciprocate NS's Affiliative behaviours. Before this, only NS and ST had a reciprocal Affiliative relationship (both POVs), and ST rose in rank (ST and S POV).

Overall comparison with Geladas and Hamadryas baboons:

The characteristics of relationships in this species appear to differ in some respects from those reported in Geladas and Hamadryas, while in others there are some strong similarities. While many of the similarities and differences have been discussed already above, three points should be emphasised.

First, as discussed above, *R. roxellana* social groups appear to be more susceptible to the effects of stressful events than those of Geladas.

Secondly, selecting individuals most likely to disperse seemed to be the strategy followed by the wild *R. roxellana* males, but this was not seen in Geladas (Dunbar, 1984). These differences in approach by males of the two species might be affected by the presence of followers in Geladas (allowing ousted males to remain in social relationships with their partners after a takeover), a strategy not readily available to *R.*

roxellana. The potential presence of more than one male in a social subunit is a key difference between Geladas and *R. roxellana*.

Thirdly, strong mother-daughter bonds, a characteristic often described in Geladas but not Hamadryas, were found in almost all social units in this study and appeared to persist under changing social conditions. This mother-daughter bond appears to be the most striking feature which places the *R. roxellana* social system closer to the one exhibited by Geladas than to that of Hamadryas Baboons.

Future directions:

There are six areas for future research which would allow for a clearer picture of the social strategies utilized by this species. These are: variations in group size, analysis and measurement of the cost and benefits of the different relationships, a greater incorporation of a temporal dimension, more representative diversity in the age range, examination of greater than dyadic relationships, and analysis of extended matrilineal relationships and male-male interactions.

Variations in group size: The interplay of relationships in both Hamadryas and Geladas can be altered by the size of the group involved (Swedell, 2006, Dunbar, 1983a, 1984, Colmenares, 2004). The social units examined in this study were of similar size, so the impact of group size on social interactions is unknown. Taking into account the social subunit size would yield a more accurate representation of the overall social network.

Analysis and measurement of the cost and benefits of the different relationships: This study relies on the assumption that Affiliative relationships are beneficial and Agonistic relationships are costly, and has identified where these relationships arise and suggested potential explanations for their occurrence; future studies will have to look at the consequences of these relationships and the actual "social value" of the benefits and costs of these interactions for this species.

A greater incorporation of a temporal dimension: A greater temporal dimension should be included in future studies as well, not just in variation of event length, but also daily time and comparison of months and seasons. The studies of the captive colonies were performed over a short period (a couple of months of intense study) whereas the wild population was examined in sections over 2 years - it is possible that relationships between individuals change with different seasons and conditions. Greater sensitivity to temporal changes in the demographic structure and environment, as well as the length of a behavioural event, should be an aspect of future studies.

More representative diversity in the age range: Another issue is the lack of diversity in the age range. The study did not have a broad enough sample to test whether females adopt different social strategies at different eras of their lives as described by Dunbar (1984) for Geladas.

Examination of greater than dyadic relationships: The focus of this study was proximate and relied on a dyadic level of analysis. While this appears adequate for many aspects of the social relationships, some, such as the mother-daughter dyads that did not express an strong Affiliative relationship, or aggression that didn't appear to be directed to the youngest (such as potentially SF), required a greater than dyadic analysis; in some of these cases this was inferred in the discussion, but the presence of third parties can alter the behaviours as documented for Hamadryas dyads (Seyfarth, 1977). Future studies should take this into account via longer-term studies and broader numbers of individuals than was conceivable in this study to identify the influences of greater than dyadic interactions.

Analysis of extended matrilineal relationships and male-male interactions: It is also important to note that as far as was known, all kin relationships between adults were limited to mother and daughter: there were no sisters, or aunts etc. Analysis of social interactions with these options available to an individual would also be worthwhile. How males interact across social groups, a defining feature of the Hamadryas social system, was also not examined in this study.

Conclusion:

The major limitations of this study are the number of individuals and the varied environments, as well as the crude nature of this analysis. This means we must be cautious in making any strong comments on the nature of the social relationships in *R. roxellana*. The objective of this study was to examine whether the pattern of social interactions in this species differed from random and to suggest, based on research performed on other species, some possible reasons for the patterns of interaction documented. The data presented here make it apparent that the individuals did show a preference for one or some individuals over others. At times, this preference does not appear very strong, as seen in the closeness of data tallies of some subjects, but overall the data, though varied, do point toward the non-random selection of interaction partners. This study suggests the influence of age; for example, younger individuals receiving more aggression. While not universal, it appears that there is a bond between mother and daughter. The presence of young offspring may also be an influence, and nursing females show an Affiliative preference for each other, while non-nursing females express a non-reciprocated preference for nursing females. The possession of immatures may result in aggression being diverted from nursing females, while non-nursing females receive higher levels of aggression. Non-nursing females direct high levels of affiliation towards the unit male, whereas the male's Affiliative preferences varied, sometimes directed towards non-nursing females and sometimes towards nursing females. Having an Affiliative relationship with the unit male may lead to the female receiving lower levels of female aggression; after some potentially stressful events, females exhibit strong Affiliative relationships with the unit male. These "rules" are not conclusive, and different individuals appear to give different values to each of them at different times, suggesting a much more flexible social system than expected. There may therefore be more "rules" involved here than identified so far, or possibly the combination of the simple "rules" creates a more complex mosaic than can be extrapolated so far. What is interesting, at least for the small number of subjects in this study, is that the bonds do not remain static but vary, suggesting the possibility that individuals in the unit continue to update their perceived social market value of other individuals and alter their interactions with these individuals accordingly.

The pattern of behavioural events does appear to have more in common with the overall patterns reported for Geladas than Hamadryas baboons, but there are differences, particularly in the data reported for the males and effects of stressful events, suggesting the need for greater research.

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Appendix 1: Behavioural events classifications

Table 1 shows the division of the Behavioural events into Affiliative, Agonistic and Other events types based on literature sources, personal observations and communication with other researchers. Wherever possible definitions that corresponded to the ones used in this study were used, though in some cases no explanation or definition was given; these were only included if the title of the Behavioural event was self explanatory, i.e. Stare or there was a slight variation, such as the radius used for a Proximity event. A combination of observations and personal communication with Keepers at the SWAP and other researchers was used to insure that the classification of each Behavioural event was not a misclassification due to species specific or individual idiosyncratic behaviours.

Four Behavioural events were kept separate from the combined scores of event types.

1. Look: Glance and Stare events: Because of the large number of Glance events recorded in the observation sessions they were scored in, Glance events were kept separately to avoid their large number overshadowing any patterns within the other Behavioural events types.

Glance events were also, along with Stare events, kept separate because of the unique nature of the scoring of these Behavioural events, in that they were focal animal initiated only Behavioural events: they were only scored when the focal subject performed the Behavioural event and not when the Behavioural event was performed by other subjects towards the focal.

2. Self groom events: Self groom events were kept separate due to this Behavioural events' directly non-interactive nature.

3. Pseudocopulation and copulation events: Pseudocopulation and copulation events were kept separate due to their potential multi-functional nature, for example fertilization, affiliation, dominance enforcement etc.

Table 1: Behavioural event classifications.

Classification	Behavioural event types	Based upon/ Suggested by
	Self groom.	
	Glance.	
	Copulation.	
	Pseudocopulation.	
Affilative events	Proximity move.	Cords (1987); Gouzoules and Gouzoules (1987); Swedell (2002) and Rowell (1966).
	Body contact.	Ren et al. (1991); Gore (1994); Mori (1979); Cords (1987) and Swedell (2002).
	Embrace.	Ren et al. (1991) and Barton et al. (1996).
	Hold lumbar.	Ren et al. (1991).
	Groom (Single groom and Reciprocal groom)	Ren et al. (1991); Stammbach (1987); Gouzoules and Gouzoules (1987); Gore (1994); Watts (2000a; 2000b); Rowell (1966); Nakamichi and Yasuhiro (2003); Leinfelder et al. (2001); Mori (1979); Cords (1987) and Swedell (2002).
Agonistic events*	Stare.	Ren et al. (1991); Walter and Seyfarth (1987); Gore (1994) and Rowell (1966).
	Approach-retreat (Run and Walk events)	Cords (1987); Seyfarth (1976); Soltis et al. (1997) and Stammbach (1987).
	Chase	Ren et al. (1991); Cords (1987); Gore (1994); Rowell (1966); Bartlett (2003) and Walters and Seyfarth (1987)

Classification	Behavioural event types	Based upon/ Suggested by
	Lunge	Ren et al (1991) and Walter and Seyfarth (1987).
	Wrestle	Swedell (2002) and Walters and Seyfarth (1987)*
	Push (Body push, Head push)	Gore (1994).
	Slap/Swipe	Ren et al. (1991); Rowell (1966); Soltis et al. (1997); Swedell (2002) and Walters and Seyfarth (1987).
Other events	Pull.(Pull, Head pull, Body pull)	
	Grab (Tail grab, Fur grab, Arm grab, Face grab)	
	Head butt.	

*described a number of aggressive acts, that taken together would conform to the definition of wrestle for this study: Hitting, Grappling, Holding down, and Biting

Appendix 2: Breakdown of SF behavioural events

Self grooming: Before removal of NSF: 6, After removal of NSF: 16

Copulation: Before NSF removal: 1 after NSF removal: 2

Total directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	**After removal**
SF	OMU	57	55
	NSF	24	N/A
	BBBG	43	32
	BBSG	65	49
	S	2	0
	ST	3	1
	NS	2	1
OMU	SF	98	56
NSF		0	N/A
BBBG		10	3
BBSG		107	47
S		1	0
ST		0	0
NS		1	0

Total events for SF.

Partner	Events scored	
	before removal	**after removal**
OMU	163	117
NSF	25	N/A
BBBG	54	42
BBSG	181	104
S	3	0
ST	3	1
NS	3	1

Total AFFILATIVE directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	After removal
SF	OMU	55	53
	NSF	24	N/A
	BBBG	38	29
	BBSG	63	49
	S	0	0
	ST	0	0
	NS	0	0
OMU	SF	87	53
NSF		0	N/A
BBBG		10	3
BBSG		83	43
S		0	0
ST		0	0
NS		0	0

Total AFFILATIVE events for SF.

Partner	Events scored	
	before removal	after removal
OMU	149	112
NSF	25	N/A
BBBG	49	39
BBSG	154	100
S	0	0
ST	0	0
NS	0	0

Total AGONISITIC directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	After removal
SF	OMU	2	2
	NSF	0	N/A
	BBBG	5	3
	BBSG	2	0
	S	2	0
	ST	3	1
	NS	2	1
OMU	SF	10	3
NSF		0	N/A
BBBG		0	0
BBSG		18	4
S		1	0
ST		0	0
NS		1	0

Total AGONISITIC events for SF.

Partner	Events scored	
	before removal	after removal
OMU	13	5
NSF	0	N/A
BBBG	5	3
BBSG	21	4
S	3	0
ST	3	1
NS	3	1

Total OTHER directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	After removal
SF	OMU	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	SF	1	0
NSF		0	N/A
BBBG		0	0
BBSG		6	0
S		0	0
ST		0	0
NS		0	0

Total OTHER events for SF.

Partner	Events scored	
	before removal	after removal
OMU	1	0
NSF	0	N/A
BBBG	0	0
BBSG	6	0
S	0	0
ST	0	0
NS	0	0

Total GLANCE directional events for SF.

Initiator	Recipient	Events scored	
		before removal	after removal
SF	OMU	98	171
	NSF	67	N/A
	BBBG	55	103
	BBSG	64	142
	S	39	50
	ST	20	53
	NS	23	59

Total STARE directional events for SF.

Initiator	Recipient	Events scored	
		before removal	after removal
SF	OMU	1	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	1	0
	ST	0	1
	NS	1	0

Total LESSER BODY CONTACT directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	After removal
SF	OMU	4	6
	NSF	0	N/A
	BBBG	4	2
	BBSG	6	2
	S	0	0
	ST	0	0
	NS	0	0
OMU	SF	6	5
NSF		0	N/A
BBBG		1	0
BBSG		7	3
S		0	0
ST		0	0
NS		0	0

Total LESSER BODY CONTACT events for SF.

Partner	Events scored	
	before removal	after removal
OMU	10	13
NSF	0	N/A
BBBG	5	3
BBSG	13	5
S	0	0
ST	0	0
NS	0	0

Total EMBRACE directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	After removal
SF	OMU	1	0
	NSF	2	N/A
	BBBG	2	0
	BBSG	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	SF	2	1
NSF		0	N/A
BBBG		2	1
BBSG		9	0
S		0	0
ST		0	0
NS		0	0

Total EMBRACE events for SF.

Partner	Events scored	
	before removal	after removal
OMU	4	1
NSF	2	N/A
BBBG	4	2
BBSG	11	2
S	0	0
ST	0	0
NS	0	0

Total GREATER BODY CONTACT directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	After removal
SF	OMU	5	4
	NSF	2	N/A
	BBBG	12	2
	BBSG	8	6
	S	0	0
	ST	0	0
	NS	0	0
OMU	SF	5	3
NSF		0	N/A
BBBG		0	0
BBSG		6	0
S		0	0
ST		0	0
NS		0	0

Total GREATER BODY CONTACT events for SF.

Partner	Events scored	
	before removal	after removal
OMU	12	7
NSF	2	N/A
BBBG	12	3
BBSG	17	6
S	0	0
ST	0	0
NS	0	0

Total SINGLE GROOM directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	After removal
SF	OMU	6	8
	NSF	0	N/A
	BBBG	1	4
	BBSG	8	5
	S	0	0
	ST	0	0
	NS	0	0
OMU	SF	3	8
NSF		0	N/A
BBBG		1	0
BBSG		14	16
S		0	0
ST		0	0
NS		0	0

Total SINGLE GROOM events for SF.

Partner	Events scored	
	before removal	after removal
OMU	9	16
NSF	0	N/A
BBBG	2	4
BBSG	22	21
S	0	0
ST	0	0
NS	0	0

Total PROXIMITY directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	**After removal**
SF	OMU	36	35
	NSF	19	N/A
	BBBG	19	21
	BBSG	37	34
	S	0	0
	ST	0	0
	NS	0	0
OMU	SF	59	33
NSF		0	N/A
BBBG		5	2
BBSG		46	24
S		0	0
ST		0	0
NS		0	0

Total PROXIMITY events for SF.

Partner	Events scored	
	before removal	**after removal**
OMU	99	72
NSF	20	N/A
BBBG	25	27
BBSG	86	64
S	0	0
ST	0	0
NS	0	0

Total RECIPROCAL GROOM directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	After removal
SF	OMU	3	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	4	2
	S	0	0
	ST	0	0
	NS	0	0
OMU	SF	1	0
NSF		0	N/A
BBBG		1	0
BBSG		0	0
S		0	0
ST		0	0
NS		0	0

Total RECIPROCAL GROOM events for SF.

Partner	Events scored	
	before removal	after removal
OMU	4	0
NSF	0	N/A
BBBG	1	0
BBSG	4	2
S	0	0
ST	0	0
NS	0	0

Total APPROACH(WALK)-RETREAT directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	After removal
SF	OMU	1	0
	NSF	0	N/A
	BBBG	3	1
	BBSG	2	0
	S	2	0
	ST	2	0
	NS	1	1
OMU	SF	4	1
NSF		0	N/A
BBBG		0	0
BBSG		8	1
S		1	0
ST		0	0
NS		1	0

Total APPROACH(WALK)-RETREAT events for SF.

Partner	Events scored	
	before removal	after removal
OMU	5	1
NSF	0	N/A
BBBG	3	1
BBSG	10	1
S	3	0
ST	2	0
NS	2	1

Total CHASE directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	**After removal**
SF	OMU	1	0
	NSF	0	N/A
	BBBG	1	0
	BBSG	0	0
	S	0	0
	ST	1	0
	NS	1	0
OMU	SF	2	0
NSF		0	N/A
BBBG		0	0
BBSG		3	0
S		0	0
ST		0	0
NS		0	0

Total CHASE events for SF.

Partner	Events scored	
	before removal	**after removal**
OMU	3	0
NSF	0	N/A
BBBG	1	0
BBSG	3	0
S	0	0
ST	1	0
NS	1	0

Total LUNGE directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	**After removal**
SF	OMU	0	0
	NSF	0	N/A
	BBBG	1	2
	BBSG	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	SF	1	0
NSF		0	N/A
BBBG		0	0
BBSG		2	0
S		0	0
ST		0	0
NS		0	0

Total LUNGE events for SF.

Partner	Events scored	
	before removal	**after removal**
OMU	1	0
NSF	0	N/A
BBBG	1	2
BBSG	2	0
S	0	0
ST	0	0
NS	0	0

Total PUSH directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	After removal
SF	OMU	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	SF	0	0
NSF		0	N/A
BBBG		0	0
BBSG		1	0
S		0	0
ST		0	0
NS		0	0

Total PUSH events for SF.

Partner	Events scored	
	before removal	after removal
OMU	0	0
NSF	0	N/A
BBBG	0	0
BBSG	1	0
S	0	0
ST	0	0
NS	0	0

Total STEAL FOOD directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	After removal
SF	OMU	0	2
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	SF	1	2
NSF		0	N/A
BBBG		0	0
BBSG		3	3
S		0	0
ST		0	0
NS		0	0

Total STEAL FOOD events for SF.

Partner	Events scored	
	before removal	after removal
OMU	1	4
NSF	0	N/A
BBBG	0	0
BBSG	3	3
S	0	0
ST	0	0
NS	0	0

Total WRESTLE directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	After removal
SF	OMU	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	SF	0	0
NSF		0	N/A
BBBG		0	0
BBSG		1	0
S		0	0
ST		0	0
NS		0	0

Total WRESTLE events for SF.

Partner	Events scored	
	before removal	after removal
OMU	1	0
NSF	0	N/A
BBBG	0	0
BBSG	2	0
S	0	0
ST	0	0
NS	0	0

Total HEAD BUTT directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	After removal
SF	OMU	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	SF	1	0
NSF		0	N/A
BBBG		0	0
BBSG		1	0
S		0	0
ST		0	0
NS		0	0

Total HEAD BUTT events for SF.

Partner	Events scored	
	before removal	after removal
OMU	1	0
NSF	0	N/A
BBBG	0	0
BBSG	1	0
S	0	0
ST	0	0
NS	0	0

Total HOLD LUMBAR directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	After removal
SF	OMU	0	0
	NSF	1	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	SF	11	3
NSF		0	N/A
BBBG		0	0
BBSG		1	0
S		0	0
ST		0	0
NS		0	0

Total HOLD LUMBAR events for SF.

Partner	Events scored	
	before removal	after removal
OMU	11	3
NSF	1	N/A
BBBG	0	0
BBSG	1	0
S	0	0
ST	0	0
NS	0	0

Total FUR GRAB directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	After removal
SF	OMU	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	SF	0	0
NSF		0	N/A
BBBG		0	0
BBSG		1	0
S		0	0
ST		0	0
NS		0	0

Total FUR GRAB events for SF.

Partner	Events scored	
	before removal	after removal
OMU	0	0
NSF	0	N/A
BBBG	0	0
BBSG	1	0
S	0	0
ST	0	0
NS	0	0

Total TAIL GRAB directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	After removal
SF	OMU	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	SF	0	0
NSF		0	N/A
BBBG		0	0
BBSG		4	0
S		0	0
ST		0	0
NS		0	0

Total TAIL GRAB events for SF.

Partner	Events scored	
	before removal	after removal
OMU	0	0
NSF	0	N/A
BBBG	0	0
BBSG	4	0
S	0	0
ST	0	0
NS	0	0

Total APPROACH(RUN)-RETREAT directional events for SF.

Initiator	Recipient	Events scored	
		Before removal	After removal
SF	OMU	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	0	1
	NS	0	0
OMU	SF	2	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		0	0
ST		0	0
NS		0	0

Total APPROACH(RUN)-RETREAT events for SF.

Partner	Events scored	
	before removal	after removal
OMU	2	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	0	0
ST	0	1
NS	0	0

Appendix 2: Breakdown of BBSG behavioural events

Self groom: Before removal of NSF: 32, **After removal of NSF:** 28

Copulation: Before removal of NSF: 5, **After removal of NSF**: 3

Total Overall directional events for BBSG.

Initiator	**Recipient**	**Events scored**	
		Before removal	**After removal**
BBSG	OMU	85	76
	NSF	68	N/A
	BBBG	62	35
	SF	98	63
	S	2	1
	ST	0	1
	NS	0	1
OMU	BBSG	72	50
NSF		23	N/A
BBBG		8	4
SF		55	23
S		1	0
ST		0	0
NS		0	0

Total Overall events for BBSG.

Partner	**Events scored**	
	before removal	**after removal**
OMU	174	151
NSF	97	N/A
BBBG	74	47
SF	160	93
S	3	1
ST	0	1
NS	0	1

Total AFFILATIVE directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	80	76
	NSF	57	N/A
	BBBG	42	27
	SF	86	58
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	68	49
NSF		23	N/A
BBBG		8	4
SF		55	23
S		0	0
ST		0	0
NS		0	0

Total AFFILATIVE events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	165	150
NSF	86	N/A
BBBG	54	39
SF	148	88
S	0	0
ST	0	0
NS	0	0

Total AGONISITIC directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	3	0
	NSF	7	N/A
	BBBG	15	7
	SF	9	3
	S	2	1
	ST	0	1
	NS	0	1
OMU	BBSG	4	1
NSF		0	N/A
BBBG		0	0
SF		0	0
S		1	0
ST		0	0
NS		0	0

Total AGONISITIC events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	7	1
NSF	7	N/A
BBBG	15	7
SF	9	3
S	3	1
ST	0	1
NS	0	1

Total OTHER directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	2	0
	NSF	4	N/A
	BBBG	5	1
	SF	3	2
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	0	0
NSF		0	N/A
BBBG		0	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total OTHER events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	2	0
NSF	4	N/A
BBBG	5	1
SF	3	2
S	0	0
ST	0	0
NS	0	0

Total GLANCE directional events for BBSG female.

Initiator	Recipient	Events scored	
		before removal	after removal
BBSG	OMU	159	98
	NSF	53	N/A
	BBBG	68	65
	SF	160	99
	S	52	26
	ST	25	49
	NS	50	48

Total STARE directional events for BBSG female.

Initiator	Recipient	Events scored	
		before removal	after removal
BBSG	OMU	2	0
	NSF	1	N/A
	BBBG	1	1
	SF	2	0
	S	0	2
	ST	0	1
	NS	0	0

Total GREATER BODY CONTACT directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	5	7
	NSF	3	N/A
	BBBG	0	0
	SF	3	1
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	6	1
NSF		0	N/A
BBBG		0	0
SF		2	0
S		0	0
ST		0	0
NS		0	0

Total GREATER BODY CONTACT events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	15	13
NSF	3	N/A
BBBG	0	1
SF	6	1
S	0	0
ST	0	0
NS	0	0

Total EMBRACE directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	9	6
	NSF	2	N/A
	BBBG	8	2
	SF	6	1
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	4	7
NSF		3	N/A
BBBG		3	2
SF		4	0
S		0	0
ST		0	0
NS		0	0

Total EMBRACE events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	21	21
NSF	7	N/A
BBBG	14	9
SF	10	2
S	0	0
ST	0	0
NS	0	0

Total SINGLE GROOM directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	12	9
	NSF	21	N/A
	BBBG	6	7
	SF	15	18
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	3	0
NSF		5	N/A
BBBG		2	2
SF		8	4
S		0	0
ST		0	0
NS		0	0

Total SINGLE GROOM events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	15	9
NSF	26	N/A
BBBG	8	9
SF	23	22
S	0	0
ST	0	0
NS	0	0

Total PROXIMITY directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	47	44
	NSF	25	N/A
	BBBG	27	16
	SF	53	34
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	44	29
NSF		6	N/A
BBBG		2	0
SF		38	14
S		0	0
ST		0	0
NS		0	0

Total PROXIMITY events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	96	77
NSF	35	N/A
BBBG	30	17
SF	97	53
S	0	0
ST	0	0
NS	0	0

Total RECIPROCAL GROOM directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	**After removal**
BBSG	OMU	3	0
	NSF	5	N/A
	BBBG	0	1
	SF	2	1
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	2	0
NSF		9	N/A
BBBG		1	0
SF		3	4
S		0	0
ST		0	0
NS		0	0

Total RECIPROCAL GROOM events for BBSG.

Partner	Events scored	
	before removal	**after removal**
OMU	5	0
NSF	14	N/A
BBBG	1	1
SF	5	5
S		0
ST		0
NS		0

Total LESSER BODY CONTACT directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	4	10
	NSF	0	N/A
	BBBG	1	0
	SF	6	3
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	3	11
NSF		0	N/A
BBBG		0	0
SF		0	1
S		0	0
ST		0	0
NS		0	0

Total LESSER BODY CONTACT events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	7	29
NSF	0	N/A
BBBG	1	1
SF	6	5
S	0	0
ST	0	0
NS	0	0

Total HOLD LUMBAR directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	0	0
	NSF	1	N/A
	BBBG	0	1
	SF	1	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	6	1
NSF		0	N/A
BBBG		0	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total HOLD LUMBAR events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	6	1
NSF	1	N/A
BBBG	0	1
SF	1	0
S	0	0
ST	0	0
NS	0	0

Total APPROACH(WALK)-RETREAT directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	0	
	NSF	2	N/A
	BBBG	9	5
	SF	2	1
	S	1	1
	ST	0	1
	NS	0	1
OMU	BBSG	4	0
NSF		0	N/A
BBBG		0	0
SF		0	0
S		1	0
ST		0	0
NS		0	0

Total APPROACH(WALK)-RETREAT events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	4	0
NSF	2	N/A
BBBG	9	5
SF	2	1
S	2	1
ST	0	1
NS	0	1

Total CHASE directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	2	0
	NSF	1	N/A
	BBBG	2	0
	SF	3	0
	S	1	0
	ST	0	0
	NS	0	0
OMU	BBSG	0	0
NSF		0	N/A
BBBG		0	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total CHASE events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	2	0
NSF	1	N/A
BBBG	2	0
SF	3	0
S	1	0
ST	0	0
NS	0	0

Total LUNGE directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	0	0
	NSF	3	N/A
	BBBG	2	0
	SF	1	1
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	0	0
NSF		0	N/A
BBBG		0	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total LUNGE events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	0	0
NSF	3	N/A
BBBG	2	0
SF	1	1
S	0	0
ST	0	0
NS	0	0

Total HEAD PUSH directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	0	0
	NSF	0	N/A
	BBBG	0	1
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	0	0
NSF		0	N/A
BBBG		0	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total HEAD PUSH events for BBSG female.

Partner	Events scored	
	before removal	after removal
OMU	0	0
NSF	0	N/A
BBBG	0	1
SF	0	0
S	0	0
ST	0	0
NS	0	0

Total STEAL FOOD directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	1	0
	NSF	0	N/A
	BBBG	2	1
	SF	1	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	0	0
NSF		0	N/A
BBBG		0	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total STEAL FOOD events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	1	0
NSF	0	N/A
BBBG	2	1
SF	1	0
S	0	0
ST	0	0
NS	0	0

Total GRAB directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	0	0
	NSF	0	N/A
	BBBG	1	0
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	0	0
NSF		0	N/A
BBBG		0	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total GRAB events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	0	0
NSF	0	N/A
BBBG	1	0
SF	0	0
S	0	0
ST	0	0
NS	0	0

Total HEAD BUTT directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	1	0
	NSF	0	N/A
	BBBG	0	1
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	0	0
NSF		0	N/A
BBBG		0	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total HEAD BUTT events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	1	0
NSF	0	N/A
BBBG	0	1
SF	0	0
S	0	0
ST	0	0
NS	0	0

Total TAIL GRAB directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	0	0
	NSF	3	N/A
	BBBG	4	0
	SF	3	1
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	0	0
NSF		0	N/A
BBBG		0	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total TAIL GRAB events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	0	0
NSF	3	N/A
BBBG	4	0
SF	3	1
S	0	0
ST	0	0
NS	0	0

Total PUSH directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	0	0
	NSF	1	N/A
	BBBG	0	0
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	0	0
NSF		0	N/A
BBBG		0	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total PUSH events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	0	0
NSF	1	N/A
BBBG	0	0
SF	0	0
S	0	0
ST	0	0
NS	0	0

Total FACE SWIPE directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	0	0
	NSF	0	N/A
	BBBG	0	0
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	0	1
NSF		0	N/A
BBBG		0	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total FACE SWIPE events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	0	1
NSF	0	N/A
BBBG	0	0
SF	0	0
S	0	0
ST	0	0
NS	0	0

Total WRESTLE directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	0	0
	NSF	0	N/A
	BBBG	0	0
	SF	1	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	0	0
NSF		0	N/A
BBBG		0	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total WRESTLE events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	0	0
NSF	0	N/A
BBBG	0	0
SF	1	0
S	0	0
ST	0	0
NS	0	0

Total FUR GRAB directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	0	0
	NSF	1	N/A
	BBBG	0	0
	SF	0	1
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	0	0
NSF		0	N/A
BBBG		0	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total FUR GRAB events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	0	0
NSF	1	N/A
BBBG	0	0
SF	0	1
S	0	0
ST	0	0
NS	0	0

Total ARM GRAB directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	1	0
	NSF	0	N/A
	BBBG	0	0
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	0	0
NSF		0	N/A
BBBG		0	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total ARM GRAB events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	1	0
NSF	0	N/A
BBBG	0	0
SF	0	0
S	0	0
ST	0	0
NS	0	0

Total HAND SWIPE directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	0	0
	NSF	0	N/A
	BBBG	0	0
	SF	1	1
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	0	0
NSF		0	N/A
BBBG		0	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total HAND SWIPE events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	0	0
NSF	0	N/A
BBBG	0	0
SF	1	1
S	0	0
ST	0	0
NS	0	0

Total HEAD PUSH directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBSG	OMU	0	0
	NSF	0	N/A
	BBBG	0	1
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBSG	0	0
NSF		0	N/A
BBBG		0	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total HEAD PUSH events for BBSG.

Partner	Events scored	
	before removal	after removal
OMU	0	0
NSF	0	N/A
BBBG	0	1
SF	0	0
S	0	0
ST	0	0
NS	0	0

Appendix 2: Breakdown of NSF behavioural events

Copulation directional events: 1

Self groom: 35

Total Overall directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	24
	BBBG	18
	BBSG	27
	SF	6
	S	1
	ST	4
	NS	0
OMU	NSF	37
BBBG		7
BBSG		100
SF		22
S		0
ST		1
NS		0

Total Overall events for NSF.

Partner	Events scored
OMU	64
BBBG	25
BBSG	140
SF	38
S	1
ST	5
NS	0

Total AFFILATIVE directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	24
	BBBG	6
	BBSG	26
	SF	4
	S	0
	ST	1
	NS	0
OMU	NSF	36
BBBG		6
BBSG		73
SF		20
S		0
ST		0
NS		0

Total AFFILATIVE events for NSF.

Partner	Events scored
OMU	63
BBBG	12
BBSG	112
SF	26
S	0
ST	1
NS	0

Total AGONISITIC Directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	0
	BBBG	12
	BBSG	1
	SF	2
	S	1
	ST	3
	NS	0
OMU	NSF	1
BBBG		1
BBSG		13
SF		10
S		0
ST		1
NS		0

Total AGONISITIC events for NSF.

Partner	Events scored
OMU	1
BBBG	13
BBSG	14
SF	12
S	1
ST	4
NS	0

Total OTHER directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	0
	BBBG	0
	BBSG	0
	SF	0
	S	0
	ST	0
	NS	0
OMU	NSF	0
BBBG		0
BBSG		14
SF		0
S		0
ST		0
NS		0

Total OTHER events for NSF.

Partner	Events scored
OMU	0
BBBG	0
BBSG	14
SF	0
S	0
ST	0
NS	0

Total GLANCE directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	191
	BBSG	150
	BBBG	98
	SF	200
	S	86
	ST	51
	NS	76

Total STARE directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	1
	BBSG	0
	BBBG	1
	SF	0
	S	0
	ST	0
	NS	1

Total EMBRACE directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	0
	BBSG	2
	BBBG	2
	SF	1
	S	0
	ST	0
	NS	0
OMU	NSF	0
NSF		0
BBSG		9
SF		1
S		0
ST		0
NS		0

Total EMBRACE events for NSF.

Partner	Events scored
OMU	0
BBSG	13
BBBG	2
SF	2
S	0
ST	0
NS	0

Total SINGLE GROOM directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	3
	BBSG	9
	BBBG	0
	SF	0
	S	0
	ST	0
	NS	0
OMU	NSF	2
BBBG		1
BBSG		22
SF		0
S		0
ST		0
NS		0

Total SINGLE GROOM events for NSF.

Partner	Events scored
OMU	5
BBSG	31
BBBG	1
SF	0
S	0
ST	0
NS	0

Total HOLD LUMBAR directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	0
	BBSG	0
	BBBG	0
	SF	0
	S	0
	ST	0
	NS	0
OMU	NSF	1
BBBG		2
BBSG		0
SF		0
S		0
ST		0
NS		0

Total HOLD LUMBAR events for NSF.

Partner	Events scored
OMU	1
BBSG	0
BBBG	2
SF	0
S	0
ST	0
NS	0

Total PROXIMITY directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	11
	BBSG	6
	BBBG	4
	SF	3
	S	
	ST	1
	NS	
OMU	NSF	27
BBBG		2
BBSG		28
SF		18
S		0
ST		0
NS		0

Total PROXIMITY events for NSF.

Partner	Events scored
OMU	41
BBSG	43
BBBG	6
SF	21
S	0
ST	1
NS	0

Total RECIPROCAL GROOM directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	6
	BBSG	8
	BBBG	0
	SF	0
	S	0
	ST	0
	NS	0
OMU	NSF	6
BBBG		0
BBSG		6
SF		0
S		0
ST		0
NS		0

Total RECIPROCAL GROOM events for NSF.

Partner	Events scored
OMU	12
BBSG	14
BBBG	0
SF	0
S	0
ST	0
NS	0

Total LESSER BODY CONTACT directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	2
	BBSG	0
	BBBG	0
	SF	0
	S	0
	ST	0
	NS	0
OMU	NSF	0
BBBG		1
BBSG		7
SF		0
S		0
ST		0
NS		0

Total LESSER BODY CONTACT events for NSF.

Partner	Events scored
OMU	2
BBSG	8
BBBG	1
SF	1
S	0
ST	0
NS	0

Total GREATER BODY CONTACT directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	2
	BBSG	1
	BBBG	0
	SF	0
	S	0
	ST	0
	NS	0
OMU	NSF	0
BBBG		0
BBSG		1
SF		1
S		0
ST		0
NS		0

Total GREATER BODY CONTACT events for NSF.

Partner	Events scored
OMU	2
BBSG	2
BBBG	0
SF	2
S	0
ST	0
NS	0

Total APPROACH(WALK)-RETREAT directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	0
	BBSG	0
	BBBG	2
	SF	0
	S	1
	ST	2
	NS	0
OMU	NSF	0
BBBG		0
BBSG		2
SF		5
S		0
ST		1
NS		0

Total APPROACH(WALK)-RETREAT events for NSF.

Partner	Events scored
OMU	0
BBSG	2
BBBG	2
SF	5
S	1
ST	3
NS	0

Total CHASE directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	0
	BBSG	0
	BBBG	8
	SF	0
	S	0
	ST	1
	NS	0
OMU	NSF	0
BBBG		1
BBSG		1
SF		0
S		0
ST		0
NS		0

Total CHASE events for NSF.

Partner	Events scored
OMU	0
BBSG	1
BBBG	9
SF	0
S	0
ST	1
NS	0

Total PUSH directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	0
	BBSG	0
	BBBG	1
	SF	0
	S	0
	ST	0
	NS	0
OMU	NSF	0
BBBG		0
BBSG		3
SF		0
S		0
ST		0
NS		0

Total PUSH events for NSF.

Partner	Events scored
OMU	0
BBSG	3
BBBG	1
SF	0
S	0
ST	0
NS	0

Total WRESTLE directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	0
	BBSG	1
	BBBG	1
	SF	1
	S	0
	ST	0
	NS	0
OMU	NSF	0
BBBG		0
BBSG		1
SF		0
S		0
ST		0
NS		0

Total WRESTLE events for NSF.

Partner	Events scored
OMU	0
BBSG	2
BBBG	1
SF	1
S	0
ST	0
NS	0

Total ARM PUSH directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	0
	BBSG	0
	BBBG	0
	SF	0
	S	0
	ST	0
	NS	0
OMU	NSF	0
BBBG		0
BBSG		5
SF		0
S		0
ST		0
NS		0

Total ARM PUSH events for NSF.

Partner	Events scored
OMU	0
BBSG	5
BBBG	0
SF	0
S	0
ST	0
NS	0

Total STEAL FOOD directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	0
	BBSG	0
	BBBG	0
	SF	0
	S	0
	ST	0
	NS	0
OMU	NSF	0
BBBG		0
BBSG		1
SF		0
S		0
ST		0
NS		0

Total STEAL FOOD events for NSF.

Partner	Events scored
OMU	0
BBSG	1
BBBG	0
SF	0
S	0
ST	0
NS	0

Total APPROACH(RUN)-RETREAT directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	0
	BBSG	0
	BBBG	0
	SF	0
	S	0
	ST	0
	NS	0
OMU	NSF	1
BBBG		0
BBSG		0
SF		4
S		0
ST		0
NS		0

Total APPROACH(RUN)-RETREAT events for NSF.

Partner	Events scored
OMU	1
BBSG	0
BBBG	0
SF	4
S	0
ST	0
NS	0

Total LUNGE directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	0
	BBSG	0
	BBBG	0
	SF	1
	S	0
	ST	0
	NS	0
OMU	NSF	0
BBBG		0
BBSG		0
SF		1
S		0
ST		0
NS		0

Total LUNGE events for NSF.

Partner	Events scored
OMU	0
BBSG	0
BBBG	0
SF	2
S	0
ST	0
NS	0

Total ARM GRAB directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	0
	BBSG	0
	BBBG	0
	SF	0
	S	0
	ST	0
	NS	0
OMU	NSF	0
BBBG		0
BBSG		4
SF		0
S		0
ST		0
NS		0

Total ARM GRAB events for NSF.

Partner	Events scored
OMU	0
BBSG	4
BBBG	0
SF	0
S	0
ST	0
NS	0

Total HEAD BUTT directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	0
	BBSG	0
	BBBG	0
	SF	0
	S	0
	ST	0
	NS	0
OMU	NSF	0
BBBG		0
BBSG		6
SF		0
S		0
ST		0
NS		0

Total HEAD BUTT events for NSF.

Partner	Events scored
OMU	0
BBSG	6
BBBG	0
SF	0
S	0
ST	0
NS	0

Total TAIL GRAB directional events for NSF.

Initiator	Recipient	Events scored
NSF	OMU	0
	BBSG	0
	BBBG	0
	SF	0
	S	0
	ST	0
	NS	0
OMU	NSF	0
BBBG		0
BBSG		4
SF		0
S		0
ST		0
NS		0

Total TAIL GRAB events for NSF.

Partner	Events scored
OMU	0
BBSG	4
BBBG	0
SF	0
S	0
ST	0
NS	0

Appendix 2: Breakdown of OMU MALE behavioural events

Self groom: Before the removal of NSF:0**, After the removal of NSF:**3

Total COPULATION directional events for OMU MALE.

Initiator	Recipient	Events scored	
		before removal	after removal
OMU MALE	SF	9	0
	NSF	0	N/A
	BBBG	1	0
	BBSG	9	2
	S	0	0
	ST	0	0
	NS	0	0

Total directional events for OMU MALE.

Initiator	Recipient	Events scored	
		Before removal	After removal
OMU MALE	SF	122	68
	NSF	24	N/A
	BBBG	19	18
	BBSG	87	61
	S	7	5
	ST	5	4
	NS	14	8
SF	OMU MALE	60	72
NSF		22	N/A
BBBG		14	8
BBSG		85	71
S		0	0
ST		0	0
NS		0	0

Total events for OMU MALE.

Partner	Events scored	
	before removal	after removal
SF	191	143
NSF	46	N/A
BBBG	34	28
BBSG	196	153
S	7	5
ST	5	4
NS	14	8

Total AFFILATIVE directional events for OMU MALE.

Initiator	Recipient	Events scored	
		Before removal	After removal
OMU MALE	SF	116	65
	NSF	24	N/A
	BBBG	18	18
	BBSG	84	61
	S	0	0
	ST	0	0
	NS	0	0
SF	OMU MALE	59	70
NSF		22	N/A
BBBG		14	8
BBSG		84	71
S		0	0
ST		0	0
NS		0	0

Total AFFILATIVE events for OMU MALE.

Partner	Events scored	
	before removal	after removal
SF	184	138
NSF	46	N/A
BBBG	33	28
BBSG	192	153
S	0	0
ST	0	0
NS	0	0

Total AGONISTIC directional events for OMU MALE.

Initiator	Recipient	Events scored	
		Before removal	After removal
OMU MALE	SF	6	3
	NSF	0	N/A
	BBBG	1	0
	BBSG	2	0
	S	7	5
	ST	5	4
	NS	14	8
SF	OMU MALE	1	1
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		0	0
ST		0	0
NS		0	0

Total AGONISITIC events for OMU MALE.

Partner	Events scored	
	before removal	**after removal**
SF	7	4
NSF	0	N/A
BBBG	1	0
BBSG	2	0
S	7	5
ST	5	4
NS	14	8

Total OTHER directional events for OMU MALE.

Initiator	Recipient	Events scored	
		Before removal	**After removal**
OMU MALE	SF	0	0
	NSF	0	0
	BBBG	0	0
	BBSG	1	0
	S	0	0
	ST	0	0
	NS	0	0
SF	OMU MALE	0	1
NSF		0	0
BBBG		0	0
BBSG		1	0
S		0	0
ST		0	0
NS		0	0

Total OTHER events for OMU MALE.

Partner	Events scored	
	before removal	after removal
SF	0	1
NSF	0	0
BBBG	0	0
BBSG	2	0
S	0	0
ST	0	0
NS	0	0

Total GLANCE directional events for OMU MALE.

Initiator	Recipient	Events scored	
		before removal	after removal
OMU MALE	SF	129	222
	NSF	43	N/A
	BBBG	54	105
	BBSG	78	189
	S	117	126
	ST	65	130
	NS	113	165

Total STARE directional events for OMU MALE.

Initiator	Recipient	Events scored	
		before removal	after removal
OMU MALE	SF	2	1
	NSF	0	N/A
	BBBG	1	0
	BBSG	1	2
	S	6	3
	ST	7	8
	NS	19	24

Total RECIPROCAL GROOM directional events for OMU MALE.

Initiator	Recipient	Events scored	
		Before removal	After removal
OMU MALE	SF	1	2
	NSF	3	N/A
	BBBG	1	0
	BBSG	0	0
	S	0	0
	ST	0	0
	NS	0	0
SF	OMU MALE	2	3
NSF		4	N/A
BBBG		1	0
BBSG		0	0
S		0	0
ST		0	0
NS		0	0

Total RECIPROCAL GROOM events for OMU MALE.

Partner	Events scored	
	before removal	after removal
SF	3	5
NSF	7	N/A
BBBG	2	0
BBSG	0	0
S	0	0
ST	0	0
NS	0	0

Total PROXIMITY directional events for OMU MALE.

Initiator	Recipient	Events scored	
		Before removal	After removal
OMU MALE	SF	71	39
	NSF	19	N/A
	BBBG	16	15
	BBSG	59	46
	S	0	0
	ST	0	0
	NS	0	0
SF	OMU MALE	30	49
NSF		13	N/A
BBBG		9	3
BBSG		52	41
S		0	0
ST		0	0
NS		0	0

Total PROXIMITY events for OMU MALE.

Partner	Events scored	
	before removal	after removal
SF	108	89
NSF	34	N/A
BBBG	25	19
BBSG	122	92
S	0	0
ST	0	0
NS	0	0

Total SINGLE GROOM directional events for OMU MALE.

Initiator	Recipient	Events scored	
		Before removal	After removal
OMU MALE	SF	6	5
	NSF	1	N/A
	BBBG	0	0
	BBSG	4	1
	S	0	0
	ST	0	0
	NS	0	0
SF	OMU MALE	10	9
NSF		2	N/A
BBBG		1	5
BBSG		10	12
S		0	0
ST		0	0
NS		0	0

Total SINGLE GROOM events for OMU MALE.

Partner	Events scored	
	before removal	after removal
SF	16	14
NSF	3	N/A
BBBG	1	5
BBSG	14	13
S	0	0
ST	0	0
NS	0	0

Total GREATER BODY CONTACT directional events for OMU MALE.

Initiator	Recipient	Events scored	
		Before removal	After removal
OMU MALE	SF	9	3
	NSF	0	N/A
	BBBG	0	2
	BBSG	9	5
	S	0	0
	ST	0	0
	NS	0	0
SF	OMU MALE	8	2
NSF		1	N/A
BBBG		0	0
BBSG		4	4
S		0	0
ST		0	0
NS		0	0

Total GREATER BODY CONTACT events for OMU MALE.

Partner	Events scored	
	before removal	after removal
SF	19	6
NSF	1	N/A
BBBG	0	2
BBSG	15	14
S	0	0
ST	0	0
NS	0	0

Total LESSER BODY CONTACT directional events for OMU MALE.

Initiator	Recipient	Events scored	
		Before removal	After removal
OMU MALE	SF	8	8
	NSF	0	N/A
	BBBG	0	1
	BBSG	3	4
	S	0	0
	ST	0	0
	NS	0	0
SF	OMU MALE	3	7
NSF		0	N/A
BBBG		1	0
BBSG		6	12
S		0	0
ST		0	0
NS		0	0

Total LESSER BODY CONTACT events for OMU MALE.

Partner	Events scored	
	before removal	**after removal**
SF	11	16
NSF	0	N/A
BBBG	1	2
BBSG	13	22
S	0	0
ST	0	0
NS	0	0

Total EMBRACE directional events for OMU MALE.

Initiator	Recipient	Events scored	
		Before removal	**After removal**
OMU MALE	SF	5	0
	NSF	1	N/A
	BBBG	1	0
	BBSG	7	3
	S	0	0
	ST	0	0
	NS	0	0
SF	OMU MALE	5	0
NSF		0	N/A
BBBG		2	0
BBSG		12	2
S		0	0
ST		0	0
NS		0	0

Total EMBRACE events for OMU MALE.

Partner	Events scored	
	before removal	after removal
SF	10	0
NSF	1	N/A
BBBG	3	0
BBSG	26	11
S	0	0
ST	0	0
NS	0	0

Total HOLD LUMBAR directional events for OMU MALE.

Initiator	Recipient	Events scored	
		Before removal	After removal
OMU MALE	SF	16	8
	NSF	0	N/A
	BBBG	0	0
	BBSG	2	2
	S	0	0
	ST	0	0
	NS	0	0
SF	OMU MALE	1	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		0	0
ST		0	0
NS		0	0

Total HOLD LUMBAR events for OMU MALE.

Partner	Events scored	
	before removal	**after removal**
SF	17	8
NSF	0	N/A
BBBG	0	0
BBSG	2	2
S	0	0
ST	0	0
NS	0	0

Total APPROACH(WALK)-RETREAT directional events for OMU MALE.

Initiator	Recipient	Events scored	
		Before removal	**After removal**
OMU MALE	SF	6	0
	NSF	0	N/A
	BBBG	1	0
	BBSG	2	0
	S	4	4
	ST	4	2
	NS	5	6
SF	OMU MALE	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		0	0
ST		0	0
NS		0	0

Total APPROACH(WALK)-RETREAT events for OMU MALE.

Partner	Events scored	
	before removal	after removal
SF	6	0
NSF	0	N/A
BBBG	1	0
BBSG	2	0
S	4	4
ST	4	2
NS	5	6

Table 1: Total FACE SWIPE directional events for OMU MALE.

Initiator	Recipient	Events scored	
		Before removal	After removal
OMU MALE	SF	0	3
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	0	0
	NS	0	0
SF	OMU MALE	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		0	0
ST		0	0
NS		0	0

Total FACE SWIPE events for OMU MALE.

Partner	Events scored	
	before removal	after removal
SF	0	3
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	0	0
ST	0	0
NS	0	0

Total ARM SWIPE directional events for OMU MALE.

Initiator	Recipient	Events scored	
		Before removal	After removal
OMU MALE	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	0	0
	NS	0	0
SF	OMU MALE	0	1
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		0	0
ST		0	0
NS		0	0

Total ARM SWIPE events for OMU MALE.

Partner	Events scored	
	before removal	after removal
SF	0	1
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	0	0
ST	0	0
NS	0	0

Total STEAL FOOD directional events for OMU MALE.

Initiator	Recipient	Events scored	
		Before removal	After removal
OMU MALE	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	0	0
	NS	0	0
SF	OMU MALE	1	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		0	0
ST		0	0
NS		0	0

Total STEAL FOOD events for OMU MALE.

Partner	Events scored	
	before removal	after removal
SF	1	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	0	0
ST	0	0
NS	0	0

Total APPROACH(RUN)-RETREAT directional events for OMU MALE.

Initiator	Recipient	Events scored	
		Before removal	After removal
OMU MALE	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	1	1
	NS	6	1
SF	OMU MALE	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		0	0
ST		0	0
NS		0	0

Total APPROACH(RUN)-RETREAT events for OMU MALE.

Partner	Events scored	
	before removal	after removal
SF		
NSF		N/A
BBBG		
BBSG		
S		
ST	1	1
NS	6	1

Total CHASE directional events for OMU MALE.

Initiator	Recipient	Events scored	
		Before removal	After removal
OMU MALE	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	3	1
	ST	0	1
	NS	3	1
SF	OMU MALE	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		0	0
ST		0	0
NS		0	0

Total CHASE events for OMU MALE MALE.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	3	1
ST	0	1
NS	3	1

Total FACE GRAB directional events for OMU MALE.

Initiator	Recipient	Events scored	
		Before removal	After removal
OMU MALE	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	1
	S	0	0
	ST	0	0
	NS	0	0
SF	OMU MALE	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		0	0
ST		0	0
NS		0	0

Total FACE GRAB events for OMU MALE.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	1
S	0	0
ST	0	0
NS	0	0

Total TAIL GRAB directional events for OMU MALE.

Initiator	Recipient	Events scored	
		Before removal	After removal
OMU MALE	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	0	0
	NS	0	0
SF	OMU MALE	0	1
NSF		0	N/A
BBBG		0	0
BBSG		1	0
S		0	0
ST		0	0
NS		0	0

Total TAIL GRAB events for OMU MALE.

Partner	Events scored	
	before removal	after removal
SF	0	1
NSF	0	N/A
BBBG	0	
BBSG	1	0
S	0	0
ST	0	0
NS	0	0

Appendix 2: Breakdown of BBBG behavioural events

Self groom: Before removal of NSF: 42, **After removal of NSF**: 18

Copulation: Before NSF removal: 1, **After removal of NSF**: 0

Total Overall directional events for BBBG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	22	11
	NSF	3	N/A
	BBSG	14	4
	SF	19	4
	S	3	0
	ST	1	0
	NS	2	2
OMU	BBBG	33	27
NSF		16	N/A
BBSG		71	41
SF		46	23
S		1	0
ST		0	1
NS		6	3

Total overall events for BBBG.

Initiator	Recipient	Events scored	
		before removal	after removal
BBBG	OMU	59	44
	NSF	19	N/A
	BBSG	88	49
	SF	69	27
	S	4	0
	ST	1	1
	NS	8	5

Total AFFILATIVE directional events for BBBG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	22	8
	NSF	2	N/A
	BBSG	14	4
	SF	18	4
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBBG	29	26
NSF		9	N/A
BBSG		42	32
SF		37	21
S		0	0
ST		0	1
NS		0	0

Total AFFILATIVE events for BBBG.

Initiator	Recipient	Events scored	
		before removal	after removal
BBBG	OMU	55	40
	NSF	11	N/A
	BBSG	59	40
	SF	59	25
	S	0	0
	ST	0	1
	NS	0	0

Total AGONISITIC directional events for BBBG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	0	3
	NSF	1	N/A
	BBSG	0	0
	SF	1	0
	S	3	0
	ST	1	0
	NS	2	2
OMU	BBBG	4	1
NSF		7	N/A
BBSG		26	7
SF		9	2
S		1	0
ST		0	0
NS		6	3

Total AGONISITIC events for BBBG.

Initiator	Recipient	Events scored	
		before removal	after removal
BBBG	OMU	4	4
	NSF	8	N/A
	BBSG	26	7
	SF	10	2
	S	4	0
	ST	1	0
	NS	8	0

Total OTHER directional events for BBBG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	0	0
	NSF	0	N/A
	BBSG	0	0
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBBG	0	0
NSF		0	N/A
BBSG		3	2
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total OTHER events for BBBG.

Initiator	Recipient	Events scored	
		before removal	after removal
BBBG	OMU	0	0
	NSF	0	N/A
	BBSG	3	2
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0

Total GLANCE events for BBBG.

Initiator	Recipient	Events scored	
		before removal	after removal
BBBG	OMU	142	88
	NSF	74	N/A
	BBSG	129	78
	SF	142	87
	S	79	22
	ST	33	35
	NS	67	28

Total STARE events for BBBG.

Initiator	Recipient	Events scored	
		before removal	after removal
BBBG	OMU	0	1
	NSF	1	0
	BBSG	0	0
	SF	0	0
	S	1	0
	ST	0	0
	NS	1	0

Total EMBRACE directional events for BBBG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	5	0
	NSF	0	N/A
	BBSG	4	2
	SF	2	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBBG	0	0
NSF		0	N/A
BBSG		4	3
SF		1	0
S		0	0
ST		0	0
NS		0	0

Total EMBRACE events for BBBG.

Initiator	Recipient	Events scored	
		before removal	after removal
BBBG	OMU	5	0
	NSF	0	N/A
	BBSG	10	8
	SF	4	0
	S	0	0
	ST	0	0
	NS	0	0

Total PROXIMITY directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	11	2
	NSF	2	N/A
	BBSG	3	2
	SF	9	4
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBBG	26	16
NSF		8	N/A
BBSG		25	18
SF		24	19
S		0	0
ST		0	1
NS		0	0

Total PROXIMITY events for BBBG.

Initiator	Recipient	Events scored	
		before removal	after removal
BBBG	OMU	41	21
	NSF	10	0
	BBSG	28	21
	SF	35	23
	S	0	0
	ST	0	1
	NS	0	0

Total LESSER BODY CONTACT directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	0	1
	NSF	0	0
	BBSG	0	0
	SF	1	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBBG	0	3
NSF		1	0
BBSG		0	1
SF		3	0
S		0	0
ST		0	0
NS		0	0

Total LESSER BODY CONTACT events for BBBG.

Initiator	Recipient	Events scored	
		before removal	after removal
BBBG	OMU	0	5
	NSF	1	0
	BBSG	1	1
	SF	4	0
	S	0	0
	ST	0	0
	NS	0	0

Total GREATER BODY CONTACT directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	2	0
	NSF	0	N/A
	BBSG	1	0
	SF	5	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBBG	1	3
NSF		0	N/A
BBSG		0	1
SF		7	0
S		0	0
ST		0	0
NS		0	0

Total GREATER BODY CONTACT events for BBBG.

Initiator	Recipient	Events scored	
		before removal	after removal
BBBG	OMU	3	5
	NSF	0	N/A
	BBSG	1	1
	SF	13	0
	S	0	0
	ST	0	0
	NS	0	0

Total SINGLE GROOM directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	4	4
	NSF	0	N/A
	BBSG	3	0
	SF	1	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBBG	1	1
NSF		0	N/A
BBSG		13	9
SF		2	2
S		0	0
ST		0	0
NS		0	0

Total SINGLE GROOM events for BBBG.

Partner	Events scored	
	before removal	after removal
OMU	5	5
NSF	0	N/A
BBSG	16	9
SF	3	2
S	0	0
ST	0	0
NS	0	0

Total RECIPROCAL GROOM directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	0	1
	NSF	0	N/A
	BBSG	3	0
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBBG	1	1
NSF		0	N/A
BBSG		0	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total RECIPROCAL GROOM events for BBBG.

Partner	Events scored	
	before removal	after removal
OMU	1	2
NSF	0	N/A
BBSG	3	0
SF	0	0
S	0	0
ST	0	0
NS	0	0

Total APPROACH (WALK)-RETREAT directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	0	0
	NSF	0	N/A
	BBSG	0	0
	SF	0	0
	S	2	0
	ST	1	0
	NS	1	2
OMU	BBBG	4	1
NSF		3	N/A
BBSG		14	4
SF		4	2
S		1	0
ST		0	0
NS		4	2

Total APPROACH (WALK)-RETREAT events for BBBG.

Partner	Events scored	
	before removal	after removal
OMU	4	1
NSF	3	N/A
BBSG	14	4
SF	4	2
S	3	0
ST	1	0
NS	5	4

Total CHASE directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	0	1
	NSF	1	N/A
	BBSG	0	0
	SF	1	0
	S	1	0
	ST	0	0
	NS	1	0
OMU	BBBG	0	0
NSF		2	N/A
BBSG		4	0
SF		1	0
S		0	0
ST		0	0
NS		1	0

Total CHASE events for BBBG.

Partner	Events scored	
	before removal	after removal
OMU	0	1
NSF	3	N/A
BBSG	4	0
SF	2	0
S	1	0
ST	0	0
NS	2	0

Total HEAD PUSH directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	0	1
	NSF	0	N/A
	BBSG	0	0
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBBG	0	0
NSF		0	N/A
BBSG		0	1
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total HEAD PUSH events for BBBG.

Partner	Events scored	
	before removal	after removal
OMU	0	1
NSF	0	N/A
BBSG	0	1
SF	0	0
S	0	0
ST	0	0
NS	0	0

Total LUNGE directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	0	1
	NSF	0	N/A
	BBSG	0	0
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBBG	0	0
NSF		2	N/A
BBSG		3	0
SF		3	0
S		0	0
ST		0	0
NS		1	0

Total LUNGE events for BBBG.

Partner	Events scored	
	before removal	after removal
OMU	0	1
NSF	2	N/A
BBSG	3	0
SF	3	0
S	0	0
ST	0	0
NS	1	0

Total PUSH directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	0	0
	NSF	0	N/A
	BBSG	0	0
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBBG	0	0
NSF		0	N/A
BBSG		0	1
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total PUSH events for BBBG.

Partner	Events scored	
	before removal	after removal
OMU	0	0
NSF	0	N/A
BBSG	0	1
SF	0	0
S	0	0
ST	0	0
NS	0	0

Total STEAL FOOD directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	0	0
	NSF	0	N/A
	BBSG	0	0
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBBG	0	0
NSF		0	N/A
BBSG		4	1
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total STEAL FOOD events for BBBG.

Partner	Events scored	
	before removal	after removal
OMU	0	0
NSF	0	N/A
BBSG	4	1
SF	0	0
S	0	0
ST	0	0
NS	0	0

Total WRESTLE directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	0	0
	NSF	0	N/A
	BBSG	0	0
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBBG	0	0
NSF		0	N/A
BBSG		1	0
SF		1	0
S		0	0
ST		0	0
NS		0	0

Total WRESTLE events for BBBG.

Partner	Events scored	
	before removal	after removal
OMU	0	0
NSF	0	N/A
BBSG	1	0
SF	1	0
S	0	0
ST	0	0
NS	0	0

Total ARM GRAB directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	0	0
	NSF	0	N/A
	BBSG	0	0
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBBG	0	0
NSF		0	N/A
BBSG		1	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total ARM GRAB events for BBBG.

Partner	Events scored	
	before removal	after removal
OMU	0	0
NSF	0	N/A
BBSG	1	0
SF	0	0
S	0	0
ST	0	0
NS	0	0

Total HEAD PULL directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	0	0
	NSF	0	N/A
	BBSG	0	0
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBBG	0	0
NSF		0	N/A
BBSG		1	2
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total HEAD PULL events for BBBG.

Partner	Events scored	
	before removal	**after removal**
OMU	0	0
NSF	0	N/A
BBSG	1	2
SF	0	0
S	0	0
ST	0	0
NS	0	0

Total HOLD LUMBAR directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	**After removal**
BBBG	OMU	0	0
	NSF	0	N/A
	BBSG	0	0
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBBG	0	2
NSF		0	N/A
BBSG		0	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total HOLD LUMBAR events for BBBG.

Partner	Events scored	
	before removal	after removal
OMU	0	2
NSF	0	N/A
BBSG	0	0
SF	0	0
S	0	0
ST	0	0
NS	0	0

Total TAIL GRAB directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	0	0
	NSF	0	N/A
	BBSG	0	0
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBBG	0	0
NSF		0	N/A
BBSG		1	0
SF		0	0
S		0	0
ST		0	0
NS		0	0

Total TAIL GRAB events for BBBG.

Partner	Events scored	
	before removal	after removal
OMU	0	0
NSF	0	N/A
BBSG	1	0
SF	0	0
S	0	0
ST	0	0
NS	0	0

Total APPROACH (RUN)-RETREAT directional events for BBSG.

Initiator	Recipient	Events scored	
		Before removal	After removal
BBBG	OMU	0	0
	NSF	0	N/A
	BBSG	0	0
	SF	0	0
	S	0	0
	ST	0	0
	NS	0	0
OMU	BBBG	0	0
NSF		0	N/A
BBSG		0	0
SF		0	0
S		0	0
ST		0	0
NS		0	1

Total APPROACH (RUN)-RETREAT events for BBBG.

Partner	Events scored	
	before removal	after removal
OMU	0	0
NSF	0	N/A
BBSG	0	0
SF	0	0
S	0	0
ST	0	0
NS	0	1

Appendix 2: Breakdown of ST behavioural events

Self groom: Before removal of NSF: 2, after removal of NSF: 4

Total directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	61	31
	S	18	7
	OMU	1	3
SF	ST	0	0
NSF		1	N/A
BBBG		3	1
BBSG		1	0
NS		153	35
S		119	13
OMU		8	5

Total events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	1	N/A
BBBG	3	1
BBSG	1	0
NS	233	80
S	147	22
OMU	9	8

Total AGONISITIC directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	11	5
	S	0	2
	OMU	1	3
SF	ST	0	0
NSF		0	N/A
BBBG		3	1
BBSG		1	0
NS		17	0
S		17	5
OMU		8	5

Total AGONISTIC events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	3	1
BBSG	1	0
NS	30	5
S	17	7
OMU	9	8

Total AFFILIATIVE directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	50	26
	S	18	5
	OMU	0	0
SF	ST	0	0
NSF		1	N/A
BBBG		0	0
BBSG		0	0
NS		133	35
S		98	8
OMU		0	0

Total AFFILIATIVE events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	1	N/A
BBBG	0	0
BBSG	0	0
NS	200	75
S	126	15
OMU	0	0

Total OTHER directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	0	0
	S	0	0
	OMU	0	0
SF	ST	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		4	0
S		3	0
OMU		0	0

Total OTHER events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	3	0
S	4	0
OMU	0	0

Total GLANCE directional events for ST.

Initiator	Recipient	Events scored	
		before removal	**after removal**
ST	SF	21	69
	NSF	7	N/A
	BBBG	15	55
	BBSG	25	62
	NS	59	114
	S	92	124
	OMU	49	106

Total STARE directional events for ST.

Initiator	Recipient	Events scored	
		before removal	**after removal**
ST	SF	0	1
	NSF	1	N/A
	BBBG	0	0
	BBSG	1	0
	NS	1	3
	S	0	0
	OMU	0	0

Total PSEUDOCOPULATION directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	7	0
	S	0	0
	OMU	0	0
SF	ST	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		0	3
S		14	1
OMU		0	0

Total PSEUDOCOPULATION events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	7	3
S	14	1
OMU	0	0

Total APPROACH(WALK)-RETREAT directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	0	2
	S	0	2
	OMU	0	0
SF	ST	0	0
NSF		0	N/A
BBBG		3	0
BBSG		1	0
NS		3	0
S		13	4
OMU		5	2

Total APPROACH(WALK)-RETREAT events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	3	0
BBSG	1	0
NS	3	2
S	13	6
OMU	5	2

Total CHASE directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	0	0
	S	0	0
	OMU	1	0
SF	ST	0	0
NSF		0	N/A
BBBG		0	1
BBSG		0	0
NS		6	0
S		2	0
OMU		1	1

Total CHASE events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	1
BBSG	0	0
NS	6	0
S	2	0
OMU	2	1

Total PROXIMITY directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	1	N/A
	BBBG	0	0
	BBSG	0	0
	NS	13	13
	S	6	4
	OMU	0	0
SF	ST	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		61	20
S		32	6
OMU			

Total PROXIMITY events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	1	N/A
BBBG	0	0
BBSG	0	0
NS	87	38
S	41	11
OMU	0	0

Total APPROACH(RUN)-RETREAT directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	0	0
	S	0	0
	OMU	0	0
SF	ST	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		1	0
S		0	1
OMU		2	0

Total APPROACH(RUN)-RETREAT events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	1	0
S	0	1
OMU	2	0

Total ARM SWIPE directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	0	0
	S	0	0
	OMU	0	2
SF	ST	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		0	0
S		0	0
OMU		0	2

Total ARM SWIPE events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	0	0
S	0	0
OMU	0	4

Total WRESTLE directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	8	1
	S	0	0
	OMU	0	1
SF	ST	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		7	0
S		0	0
OMU		0	0

Total WRESTLE events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	17	1
S	0	0
OMU	0	1

Total STEAL FOOD directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	0	1
	S	0	0
	OMU	0	0
SF	ST	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		0	0
S		1	0
OMU		0	0

Total STEAL FOOD events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	0	1
S	1	0
OMU	0	0

Total EMBRACE directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	3	1
	S	0	0
	OMU	0	0
SF	ST	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		9	0
S		28	1
OMU		0	0

Total EMBRACE events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	15	2
S	32	2
OMU	0	0

Total SINGLE GROOM directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	20	9
	S	8	1
	OMU	0	0
SF	ST	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		6	1
S		18	0
OMU		0	0

Total SINGLE GROOM events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	26	10
S	26	1
OMU	0	0

Total HOLD LUMBAR directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	1	0
	S	0	0
	OMU	0	0
SF	ST	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		2	0
S		6	1
OMU		0	0

Total HOLD LUMBAR events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	3	0
S	6	1
OMU	0	0

Total LESSER BODY CONTACT directional events for ST

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	0	0
	S	0	0
	OMU	0	0
SF	ST	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		19	3
S		5	0
OMU		0	0

Total LESSER BODY CONTACT events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	19	7
S	6	0
OMU	0	0

Total GREATER BODY CONTACT directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	4	0
	S	0	0
	OMU	0	0
SF	ST	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		24	7
S		7	0
OMU		0	0

Total GREATER BODY CONTACT events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	29	11
S	9	0
OMU	0	0

Total RECIPROCAL GROOM directional events for ST

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	9	3
	S	4	0
	OMU	0	0
SF	ST	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		12	4
S		2	0
OMU		0	0

Total RECIPROCAL GROOM events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	21	7
S	6	0
OMU	0	0

Total HEAD BUTT directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	0	0
	S	0	0
	OMU	0	0
SF	ST	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		0	0
S		1	0
OMU		0	0

Total HEAD BUTT events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	0	0
S	1	0
OMU	0	0

Total ARM GRAB directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	0	0
	S	0	0
	OMU	0	0
SF	ST	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		0	0
S		1	0
OMU		0	0

Total ARM GRAB events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	0	0
S	1	0
OMU	0	0

Total FUR GRAB directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	0	0
	S	0	0
	OMU	0	0
SF	ST	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		0	0
S		2	0
OMU		0	0

Total FUR GRAB events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	0	0
S	2	0
OMU	0	0

Total TAIL GRAB directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	0	0
	S	0	0
	OMU	0	0
SF	ST	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		3	0
S		0	0
OMU		0	0

Total TAIL GRAB events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	3	0
S	0	0
OMU	0	0

Total PUSH directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	1	0
	S	0	0
	OMU	0	0
SF	ST	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		0	0
S		0	0
OMU		0	0

Total PUSH events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	1	0
S	0	0
OMU	0	0

Total LUNGE directional events for ST.

Initiator	Recipient	Events scored	
		Before removal	After removal
ST	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	2	1
	S	0	0
	OMU	0	0
SF	ST	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		0	0
S		1	0
OMU		0	0

Total LUNGE events for ST.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	2	1
S	1	0
OMU	0	0

Appendix 2: Breakdown of S behavioural events

Self groom: Before removal of NSF: 2, **After removal of NSF:** 1

Total directional events for S.

Initiator	**Recipient**	**Events scored**	
		Before removal	**After removal**
S	SF	1	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	74	6
	ST	130	3
	OMU	1	0
SF	S	1	0
NSF		5	N/A
BBBG		4	0
BBSG		4	1
NS		193	33
ST		25	17
OMU		19	1

Total events for S.

Partner	**Events scored**	
	before removal	**after removal**
SF	2	0
NSF	5	N/A
BBBG	4	0
BBSG	4	1
NS	281	41
ST	165	20
OMU	22	1

Total AFFILATIVE directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	57	7
	ST	107	3
	OMU	0	0
SF	S	0	0
NSF		1	N/A
BBBG		1	0
BBSG		1	0
NS		170	29
ST		24	9
OMU		0	0

Total AFFILATIVE events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	1	N/A
BBBG	1	0
BBSG	1	0
NS	241	37
ST	141	12
OMU	0	0

Total AGONISTIC directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	1	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	17	0
	ST	19	0
	OMU	1	0
SF	S	1	0
NSF		4	N/A
BBBG		3	0
BBSG		3	1
NS		10	0
ST		1	8
OMU		19	1

Total AGONISTIC events for S.

Partner	Events scored	
	before removal	after removal
SF	2	0
NSF	4	N/A
BBBG	3	0
BBSG	3	1
NS	27	0
ST	20	8
OMU	22	1

Total OTHER directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	0	0
	ST	4	0
	OMU	0	0
SF	S	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		13	4
ST		0	0
OMU		0	0

Total OTHER events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	13	4
ST	4	0
OMU	0	0

Total GLANCE directional events for S.

Initiator	Recipient	Events scored	
		before removal	**after removal**
S	SF	85	34
	NSF	61	N/A
	BBBG	54	25
	BBSG	92	34
	NS	241	71
	ST	140	91
	OMU	289	46

Total STARE directional events for S.

Initiator	Recipient	Events scored	
		before removal	**after removal**
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	1	0
	NS	3	0
	ST	0	0
	OMU	2	0

Total PSEUDOCOPULATION directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	1	1
	ST	11	0
	OMU	0	0
SF	S	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		0	1
ST		0	0
OMU		0	0

Total PSEUDOCOPULATION events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	1	2
ST	11	0
OMU	0	0

Total APPROACH(WALK)-RETREAT directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	1	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	7	0
	ST	18	0
	OMU	0	0
SF	S	1	0
NSF		4	N/A
BBBG		2	0
BBSG		1	1
NS		8	0
ST		0	8
OMU		8	0

Total APPROACH(WALK)-RETREAT events for S.

Partner	Events scored	
	before removal	after removal
SF	2	0
NSF	4	N/A
BBBG	2	0
BBSG	1	1
NS	15	0
ST	18	8
OMU	8	0

Total PROXIMITY directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	39	6
	ST	42	3
	OMU	0	0
SF	S	0	0
NSF		1	N/A
BBBG		1	0
BBSG		1	0
NS		91	25
ST		4	7
OMU		0	0

Total PROXIMITY events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	1	N/A
BBBG	1	0
BBSG	1	0
NS	137	32
ST	50	10
OMU	0	0

Total CHASE directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	0	0
	ST	0	0
	OMU	1	0
SF	S	0	0
NSF		0	N/A
BBBG		0	0
BBSG		1	0
NS		1	0
ST		1	0
OMU		10	0

Total CHASE events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	1	0
NS	1	0
ST	1	0
OMU	11	0

Total PUSH directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	2	0
	ST	0	0
	OMU	0	0
SF	S	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		1	0
ST		0	0
OMU		0	0

Total PUSH events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	3	0
ST	0	0
OMU	0	0

Total APPROACH(RUN)-RETREAT directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	2	0
	ST	0	0
	OMU	0	0
SF	S	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		0	0
ST		0	0
OMU		1	1

Total APPROACH(RUN)-RETREAT events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	2	0
ST	0	0
OMU	1	1

Total LUNGE directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	1	0
	ST	0	0
	OMU	0	0
SF	S	0	0
NSF		0	N/A
BBBG		1	0
BBSG		1	0
NS		0	0
ST		0	0
OMU		0	0

Total LUNGE events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	1	0
BBSG	1	0
NS	1	0
ST	0	0
OMU	0	0

Total STEAL FOOD directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	2	0
	ST	1	0
	OMU	0	0
SF	S	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		0	0
ST		0	0
OMU		0	0

Total STEAL FOOD events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	2	0
ST	1	0
OMU	0	0

Total WRESTLE directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	3	0
	ST	0	0
	OMU	0	0
SF	S	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		0	0
ST		0	0
OMU		0	0

Total WRESTLE events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	3	0
ST	0	0
OMU	2	0

Total LESSER BODY CONTACT directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	1	0
	ST	7	0
	OMU	0	0
SF	S	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		27	0
ST		1	2
OMU		0	0

Total LESSER BODY CONTACT events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	29	1
ST	9	2
OMU	0	0

Total GREATER BODY CONTACT directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	7	0
	ST	6	0
	OMU	0	0
SF	S	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		25	0
ST		1	0
OMU		0	0

Total GREATER BODY CONTACT events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	35	0
ST	10	0
OMU	0	0

Total EMBRACE directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	4	0
	ST	30	0
	OMU	0	0
SF	S	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		10	0
ST		0	0
OMU		0	0

Total EMBRACE events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	17	0
ST	32	0
OMU	0	0

Total HOLD LUMBAR directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	1	0
	ST	10	0
	OMU	0	0
SF	S	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		4	0
ST		0	0
OMU		0	0

Total HOLD LUMBAR events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	5	0
ST	10	0
OMU	0	0

Total SINGLE GROOM directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	3	0
	ST	10	0
	OMU	0	0
SF	S	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		13	4
ST		15	0
OMU		0	0

Total SINGLE GROOM events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	16	4
ST	25	0
OMU	0	0

Total RECIPROCAL GROOM directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	2	0
	ST	2	0
	OMU	0	0
SF	S	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		0	0
ST		3	0
OMU		0	0

Total RECIPROCAL GROOM events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	2	0
ST	5	0
OMU	0	0

Total TAIL GRAB directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	0	0
	ST	0	0
	OMU	0	0
SF	S	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		5	3
ST		0	0
OMU		0	0

Total TAIL GRAB events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	5	3
ST	0	0
OMU	0	0

Total FACE GRAB directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	0	0
	ST	0	0
	OMU	0	0
SF	S	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		4	0
ST		0	0
OMU		0	0

Total FACE GRAB events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	4	0
ST	0	0
OMU	0	0

Total FUR GRAB directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	0	0
	ST	1	0
	OMU	0	0
SF	S	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		4	0
ST		0	0
OMU		0	0

Total FUR GRAB events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	4	0
ST	1	0
OMU	0	0

Total HAND PULL directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	0	0
	ST	0	0
	OMU	0	0
SF	S	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		0	1
ST		0	0
OMU		0	0

Total HAND PULL events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	0	1
ST	0	0
OMU	0	0

Total HEAD BUTT directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	0	0
	ST	2	0
	OMU	0	0
SF	S	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		0	0
ST		0	0
OMU		0	0

Total HEAD BUTT events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	0	0
ST	2	0
OMU	0	0

Total ARM PULL directional events for S.

Initiator	Recipient	Events scored	
		Before removal	After removal
S	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	NS	0	0
	ST	1	0
	OMU	0	0
SF	S	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
NS		0	0
ST		0	0
OMU		0	0

Total ARM PULL events for S.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
NS	0	0
ST	1	0
OMU	0	0

Appendix 2: Breakdown of NS behavioural events

Self groom: Before the removal of NSF: 14. **After the removal of NSF:** 2

Total directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	0
	BBBG	1	0
	BBSG	0	0
	S	114	38
	ST	244	41
	OMU	0	0
SF	NS	3	0
NSF		5	0
BBBG		4	2
BBSG		11	0
S		74	14
ST		93	41
OMU		34	8

Total events for NS.

Partner	Events scored	
	before removal	after removal
SF	3	3
NSF	5	N/A
BBBG	5	2
BBSG	11	0
S	191	56
ST	355	89
OMU	34	8

Total AFFILATIVE directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	1	0
	BBSG	0	0
	S	114	33
	ST	186	39
	OMU	0	0
SF	NS	0	0
NSF		1	N/A
BBBG		0	0
BBSG		0	0
S		46	10
ST		66	34
OMU		1	0

Total AFFILATIVE events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	1	N/A
BBBG	1	0
BBSG	0	0
S	262	47
ST	163	80
OMU	1	0

Total AGONISTIC directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	3
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	1
	ST	43	1
	OMU	0	0
SF	NS	3	0
NSF		4	N/A
BBBG		4	2
BBSG		11	0
S		24	4
ST		24	6
OMU		33	8

Total AGONISTIC events for NS.

Partner	Events scored	
	before removal	after removal
SF	3	3
NSF	4	N/A
BBBG	4	2
BBSG	11	0
S	24	5
ST	75	7
OMU	33	8

Total OTHER directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	4
	ST	15	1
	OMU	0	0
SF	NS	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		4	0
ST		3	1
OMU		0	0

Total OTHER events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	4	4
ST	18	2
OMU	0	0

Total GLANCE directional events for NS.

Initiator	Recipient	Events scored	
		before removal	after removal
NS	SF	164	84
	NSF	122	N/A
	BBBG	107	99
	BBSG	160	89
	S	325	84
	ST	185	88
	OMU	359	126

Total STARE directional events for NS.

Initiator	Recipient	Events scored	
		before removal	after removal
NS	SF	0	1
	NSF	0	N/A
	BBBG	0	1
	BBSG	0	1
	S	0	0
	ST	2	0
	OMU	0	0

Total PSEUDOCOPULATION directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	0	0
	OMU	0	0
SF	NS	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		1	0
ST		5	0
OMU		0	0

Total PSEUDOCOPULATION events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	1	0
ST	5	0
OMU	0	0

Total APPROACH(WALK)-RETREAT directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	5	0
	OMU	0	0
SF	NS	1	0
NSF		0	N/A
BBBG		1	0
BBSG		3	0
S		18	0
ST		6	4
OMU		17	3

Total APPROACH(WALK)-RETREAT events for NS.

Partner	Events scored	
	before removal	after removal
SF	1	0
NSF	0	N/A
BBBG	1	0
BBSG	3	0
S	18	0
ST	11	4
OMU	17	3

Total CHASE directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	10	1
	OMU	0	0
SF	NS	1	0
NSF		4	N/A
BBBG		2	1
BBSG		7	0
S		1	1
ST		0	0
OMU		13	2

Total CHASE events for NS.

Partner	Events scored	
	before removal	after removal
SF	1	0
NSF	4	N/A
BBBG	2	1
BBSG	7	0
S	1	1
ST	10	1
OMU	13	2

Total LUNGE directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	1
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	0	0
	OMU	0	0
SF	NS	1	0
NSF		0	N/A
BBBG		1	1
BBSG		1	0
S		1	0
ST		0	1
OMU		0	0

Total LUNGE events for NS.

Partner	Events scored	
	before removal	after removal
SF	1	1
NSF	0	N/A
BBBG	1	1
BBSG	1	0
S	1	0
ST	0	1
OMU	0	0

Total EMBRACE directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	8	0
	ST	12	1
	OMU	0	0
SF	NS	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		2	0
ST		0	0
OMU		0	0

Total EMBRACE events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	11	1
ST	13	3
OMU	0	0

Total LESSER BODY CONTACT directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	16	4
	ST	30	6
	OMU	0	0
SF	NS	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		2	1
ST		1	3
OMU		0	0

Total LESSER BODY CONTACT events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	18	7
ST	31	11
OMU	0	0

Total GREATER BODY CONTACT directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	20	3
	ST	48	4
	OMU	0	0
SF	NS	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		2	0
ST		2	1
OMU		0	0

Total GREATER BODY CONTACT events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	22	3
ST	53	7
OMU	0	0

Total SINGLE GROOM directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	6	2
	ST	6	0
	OMU	0	0
SF	NS	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		0	0
ST		32	13
OMU		0	0

Total SINGLE GROOM events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	6	2
ST	38	13
OMU	0	0

Total HOLD LUMBAR directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	1	0
	ST	3	0
	OMU	0	0
SF	NS	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		1	0
ST		2	1
OMU		0	0

Total HOLD LUMBAR events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	2	0
ST	5	1
OMU	0	0

Total PROXIMITY directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	1	0
	BBSG	0	0
	S	63	24
	ST	75	22
	OMU	0	0
SF	NS	0	0
NSF		1	N/A
BBBG		0	0
BBSG		0	0
S		38	9
ST		21	13
OMU		1	0

Total PROXIMITY events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	1	N/A
BBBG	1	0
BBSG	0	0
S	103	34
ST	139	36
OMU	1	0

Total RECIPROCAL GROOM directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	12	6
	OMU	0	0
SF	NS	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		1	0
ST		8	3
OMU		0	0

Total RECIPROCAL GROOM events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	1	0
ST	20	9
OMU	0	0

Total STEAL FOOD directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	1
	ST	0	0
	OMU	0	0
SF	NS	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		2	1
ST		3	1
OMU		0	0

Total STEAL FOOD events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	2	2
ST	3	1
OMU	0	0

Total PUSH directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	0	0
	OMU	0	0
SF	NS	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		0	1
ST		0	0
OMU		0	0

Total PUSH events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	0	1
ST	0	0
OMU	0	0

Total SWIPE directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	0	0
	OMU	0	0
SF	NS	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		1	1
ST		1	0
OMU		0	0

Total SWIPE events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	1	1
ST	1	0
OMU	0	0

Total APPROACH(RUN)-RETREAT directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	1
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	0	0
	OMU	0	0
SF	NS	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		1	0
ST		0	0
OMU		3	3

Total APPROACH(RUN)-RETREAT events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	1
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	1	0
ST	0	0
OMU	3	3

Total FACE GRAB directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	1
	ST	0	0
	OMU	0	0
SF	NS	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		0	0
ST		0	0
OMU		0	0

Total FACE GRAB events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	0	1
ST	0	0
OMU	0	0

Total HEAD PULL directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	1
	ST	1	0
	OMU	0	0
SF	NS	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		0	0
ST		0	0
OMU		0	0

Total HEAD PULL events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	0	1
ST	1	0
OMU	0	0

Total TAIL GRAB directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	2
	ST	7	1
	OMU	0	0
SF	NS	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		0	0
ST		3	0
OMU		0	0

Total TAIL GRAB events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	0	2
ST	10	1
OMU	0	0

Total FUR GRAB directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	2	0
	OMU	0	0
SF	NS	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		1	0
ST		0	0
OMU		0	0

Total FUR GRAB events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	1	0
ST	2	0
OMU	0	0

Total HEAD BUTT directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	3	0
	OMU	0	0
SF	NS	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		3	0
ST		0	1
OMU		0	0

Total HEAD BUTT events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	3	0
ST	3	1
OMU	0	0

Total WRESTLE directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	1
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	28	0
	OMU	0	0
SF	NS	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		0	0
ST		14	0
OMU		0	0

Total WRESTLE events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	1
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	0	0
ST	50	0
OMU	0	0

Total ARM GRAB directional events for NS.

Initiator	Recipient	Events scored	
		Before removal	After removal
NS	SF	0	0
	NSF	0	N/A
	BBBG	0	0
	BBSG	0	0
	S	0	0
	ST	2	0
	OMU	0	0
SF	NS	0	0
NSF		0	N/A
BBBG		0	0
BBSG		0	0
S		0	0
ST		0	0
OMU		0	0

Total ARM GRAB events for NS.

Partner	Events scored	
	before removal	after removal
SF	0	0
NSF	0	N/A
BBBG	0	0
BBSG	0	0
S	0	0
ST	2	0
OMU	0	0

Appendix 2: Breakdown of WC behavioural events

Self groom: Periods when male was not present: 30, **Period when male was present**: 8
Copulation: Without male: 0, **Male present:** 3

Total directional events for WC.

Initiator	Recipient	Events scored	
		Without male	**With Male**
WC	BBBG2	25	6
	OBN	83	25
	OG	9	5
	SHM	23	17
	Male	N/A	8
BBBG2	WC	30	8
OBN		60	29
OG		20	6
SHM		19	16
Male		N/A	15

Total events for WC.

Partner	Events scored	
	Without male	**With Male**
BBBG2	63	15
OBN	160	65
OG	31	14
SHM	46	41
Male	N/A	29

Total directional AFFILATIVE events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	24	6
	OBN	72	24
	OG	8	5
	SHM	20	17
	Male	N/A	8
BBBG2	WC	29	8
OBN		48	29
OG		20	6
SHM		19	16
Male		N/A	10

Total affiliative events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2	61	15
OBN	136	64
OG	30	14
SHM	43	41
Male	N/A	24

Total directional AGONISITIC events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	1	0
	OBN	11	1
	OG	1	0
	SHM	3	0
	Male	N/A	0
BBBG2	WC	1	0
OBN		6	0
OG		0	0
SHM		0	0
Male		N/A	5

Total AGONISITIC events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2	2	0
OBN	18	1
OG	1	0
SHM	3	0
Male	N/A	5

Total directional OTHER events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	0	0
	OBN	0	0
	OG	0	0
	SHM	0	0
	Male	N/A	0
BBBG2	WC	0	0
OBN		6	0
OG		0	0
SHM		0	0
Male		N/A	0

Total OTHER events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OBN	6	0
OG	0	0
SHM	0	0
Male	N/A	0

Total GLANCE events for WC.

Partner	Events scored	
	Without male	**With Male**
BBBG2	44	19
OBN	71	24
OG	57	17
SHM	27	19
Male	N/A	38

Total STARE events for WC.

Partner	Events scored	
	Without male	**With Male**
BBBG2	0	0
OBN	0	0
OG	1	0
SHM	0	0
Male	N/A	0

Total directional ADJACENT BOX PROXIMITY events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	0	0
	OBN	0	0
	OG	0	0
	SHM	0	0
	Male	N/A	0
BBBG2	WC	0	0
OBN		0	1
OG		0	1
SHM		0	0
Male		N/A	0

Total ADJACENT BOX PROXIMITY events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2		0
OBN		1
OG		1
SHM		0
Male	N/A	0

Total directional LESSER BODY CONTACT events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	2	0
	OBN	3	2
	OG	0	0
	SHM	0	4
	Male	N/A	2
BBBG2	WC	2	1
OBN		2	4
OG		1	0
SHM		1	3
Male		N/A	0

Total LESSER BODY CONTACT events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2	4	1
OBN	5	9
OG	1	0
SHM	2	8
Male	N/A	3

Total directional GREATER BODY CONTACT events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	0	1
	OBN	1	1
	OG	0	0
	SHM	1	4
	Male	N/A	0
BBBG2	WC	1	0
OBN		1	2
OG		0	0
SHM		1	1
Male		N/A	0

Total GREATER BODY CONTACT events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2	1	1
OBN	3	6
OG	0	0
SHM	3	5
Male	N/A	1

Total directional SINGLE GROOM events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	2	0
	OBN	33	10
	OG	2	1
	SHM	6	3
	Male	N/A	2
BBBG2	WC	9	1
OBN		9	0
OG		2	1
SHM		2	0
Male		N/A	3

Total SINGLE GROOM events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2	11	1
OBN	42	10
OG	4	2
SHM	8	3
Male	N/A	5

Total directional WITHIN BOX PROXIMITY events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	0	0
	OBN	0	0
	OG	0	0
	SHM	0	0
	Male	N/A	0
BBBG2	WC		0
OBN			1
OG			0
SHM			0
Male		N/A	0

Total WITHIN BOX PROXIMITY events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2		1
OBN		1
OG		1
SHM		1
Male	N/A	0

Total directional PROXIMITY events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	17	5
	OBN	25	11
	OG	6	4
	SHM	10	5
	Male	N/A	4
BBBG2	WC	17	6
OBN		31	21
OG		17	4
SHM		13	11
Male		N/A	6

Total PROXIMITY events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2	37	11
OBN	70	37
OG	25	10
SHM	25	21
Male	N/A	14

Total directional EMBRACE events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	1	0
	OBN	3	0
	OG	0	0
	SHM	0	0
	Male	N/A	0
BBBG2	WC	0	0
OBN		0	0
OG		0	0
SHM		0	0
Male		N/A	0

Total EMBRACE events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2	6	0
OBN	4	0
OG	0	0
SHM	2	1
Male	N/A	0

Total directional RECIPROCAL GROOM events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	2	0
	OBN	2	0
	OG	0	0
	SHM	1	1
	Male	N/A	0
BBBG2	WC	0	0
OBN		5	0
OG		0	0
SHM		2	1
Male		N/A	0

Total RECIPROCAL GROOM events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2	2	0
OBN	7	0
OG	0	0
SHM	3	2
Male	N/A	0

Total directional CHASE events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	0	0
	OBN	3	0
	OG	0	0
	SHM	0	0
	Male	N/A	0
BBBG2	WC	1	0
OBN		1	0
OG		0	0
SHM		0	0
Male		N/A	0

Total CHASE events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2	1	0
OBN	4	0
OG	0	0
SHM	0	0
Male	N/A	0

Total directional HAND SWIPE events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	1	0
	OBN	2	0
	OG	0	0
	SHM	0	0
	Male	N/A	0
BBBG2	WC	0	0
OBN		0	0
OG		0	0
SHM		0	0
Male		N/A	0

Total HAND SWIPE events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2	1	0
OBN	2	0
OG	0	0
SHM	0	0
Male	N/A	0

Total directional HOLD LUMBAR events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	0	0
	OBN	5	0
	OG	0	0
	SHM	0	0
	Male	N/A	0
BBBG2	WC	0	0
OBN		0	0
OG		0	0
SHM		0	0
Male		N/A	0

Total HOLD LUMBAR events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OBN	5	0
OG	0	0
SHM	0	0
Male	N/A	0

Total directional APPROACH(WALK)-RETREAT events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	0	0
	OBN	0	0
	OG	1	0
	SHM	0	0
	Male	N/A	0
BBBG2	WC	0	0
OBN		2	0
OG		0	0
SHM		1	0
Male		N/A	5

Total APPROACH-RETREAT events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OBN	2	0
OG	1	0
SHM	1	0
Male	N/A	5

Total directional STEAL FOOD events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	0	0
	OBN	1	1
	OG	0	0
	SHM	0	0
	Male	N/A	0
BBBG2	WC	0	0
OBN		3	0
OG		0	0
SHM		0	0
Male		N/A	0

Total STEAL FOOD events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OBN	4	1
OG	0	0
SHM	0	0
Male	N/A	0

Total directional WRESTLE events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	0	0
	OBN	1	0
	OG	0	0
	SHM	0	0
	Male	N/A	0
BBBG2	WC	0	0
OBN		0	0
OG		0	0
SHM		0	0
Male		N/A	0

Total WRESTLE events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OBN	2	0
OG	0	0
SHM	0	0
Male	N/A	0

Total directional LUNGE events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	0	0
	OBN	3	0
	OG	0	0
	SHM	0	0
	Male	N/A	0
BBBG2	WC	0	0
OBN		0	0
OG		0	0
SHM		0	0
Male		N/A	0

Total LUNGE events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OBN	3	0
OG	0	0
SHM	0	0
Male	N/A	0

Total directional PUSH events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	0	0
	OBN	1	0
	OG	0	0
	SHM	0	0
	Male	N/A	0
BBBG2	WC	0	0
OBN		0	0
OG		0	0
SHM		0	0
Male		N/A	0

Total PUSH events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OBN	1	0
OG	0	0
SHM	0	0
Male	N/A	0

Total directional HEAD PULL events for WC.

Initiator	Recipient	Events scored	
		Without male	With Male
WC	BBBG2	0	0
	OBN	0	0
	OG	0	0
	SHM	0	0
	Male	N/A	0
BBBG2	WC	0	0
OBN		6	0
OG		0	0
SHM		0	0
Male		N/A	0

Total HEAD PULL events for WC.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OBN	6	0
OG	0	0
SHM	0	0
Male	N/A	0

Appendix 2: Breakdown of OBN behavioural events

Self groom: Periods when male was not present: 33, **Period when male was present:** 10

Total directional events for OBN.

Initiator	**Recipient**	**Events scored**	
		Without male	**With Male**
OBN	BBBG2	22	7
	OG	35	8
	SHM	37	3
	WC	71	29
	Male	N/A	7
BBBG2	OBN	24	2
OG		15	2
SHM		18	3
WC		55	17
Male		N/A	13

Total events for OBN.

Partner	**Events scored**	
	Without male	**With Male**
BBBG2	50	14
OG	53	12
SHM	62	10
WC	135	59
Male	N/A	21

\

Total AFFILIATIVE directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	22	7
	OG	30	8
	SHM	37	3
	WC	59	24
	Male	N/A	5
BBBG2	OBN	21	2
OG		14	2
SHM		18	3
WC		52	15
Male		N/A	3

Total AFFILIATIVE events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	47	14
OG	47	12
SHM	62	10
WC	120	52
Male	N/A	9

\

Total AGONISITIC directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	0	0
	OG	5	0
	SHM	0	0
	WC	3	5
	Male	N/A	2
BBBG2	OBN	3	0
OG		1	0
SHM		0	0
WC		3	2
Male		N/A	10

Total AGONISITIC events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	3	0
OG	6	0
SHM	0	0
WC	6	7
Male	N/A	12

\

Total OTHER directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	0	0
	OG	0	0
	SHM	0	0
	WC	9	0
	Male	N/A	0
BBBG2	OBN	0	0
OG		0	0
SHM		0	0
WC		0	0
Male		N/A	0

Total OTHER events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OG	0	0
SHM	0	0
WC	9	0
Male	N/A	0

\

Total GLANCE directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	51	13
	OG	63	19
	SHM	38	20
	WC	49	41
	Male	N/A	58

Total STARE directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	0	1
	OG	0	0
	SHM	0	0
	WC	0	0
	Male	N/A	0

\

Total LESSER BODY CONTACT directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	1	0
	OG	0	0
	SHM	0	0
	WC	3	3
	Male	N/A	1
BBBG2	OBN	0	0
OG		1	0
SHM		0	0
WC		1	0
Male		N/A	0

Total LESSER BODY CONTACT events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	1	1
OG	1	0
SHM	4	0
WC	8	4
Male	N/A	1

\

Total PROXIMITY directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	11	3
	OG	25	7
	SHM	19	1
	WC	39	16
	Male	N/A	1
BBBG2	OBN	14	2
OG		11	2
SHM		9	2
WC		23	6
Male		N/A	2

Total PROXIMITY events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	29	6
OG	39	9
SHM	33	3
WC	67	28
Male	N/A	4

\

Total WITHIN BOX PROXIMITY directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	1	0
	OG	1	0
	SHM	0	0
	WC	1	0
	Male	N/A	0
BBBG2	OBN	0	0
OG		0	0
SHM		0	1
WC		0	0
Male		N/A	0

Total WITHIN BOX PROXIMITY events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	1	3
OG	1	1
SHM	0	4
WC	1	2
Male	N/A	0

\

Total SINGLE GROOM directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	3	3
	OG	1	1
	SHM	12	1
	WC	7	4
	Male	N/A	1
BBBG2	OBN	6	0
OG		0	0
SHM		4	0
WC		22	8
Male		N/A	1

Total SINGLE GROOM events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	9	3
OG	1	1
SHM	16	1
WC	29	12
Male	N/A	2

\

Total RECIPROCAL GROOM directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	1	2
	OG	0	0
	SHM	3	0
	WC	3	2
	Male	N/A	0
BBBG2	OBN	1	0
OG		0	0
SHM		3	1
WC		2	1
Male		N/A	0

Total RECIPROCAL GROOM events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	2	2
OG	0	0
SHM	6	1
WC	5	3
Male	N/A	0

\

Total GREATER BODY CONTACT directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	0	0
	OG	0	0
	SHM	1	1
	WC	1	1
	Male	N/A	0
BBBG2	OBN	0	0
OG		0	0
SHM		0	0
WC		1	1
Male		N/A	0

Total GREATER BODY CONTACT events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OG	0	0
SHM	2	2
WC	6	6
Male	N/A	0

\

Total EMBRACE directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	2	1
	OG	2	0
	SHM	0	0
	WC	1	0
	Male	N/A	2
BBBG2	OBN	0	0
OG		0	0
SHM		0	0
WC		0	0
Male		N/A	0

Total EMBRACE events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	2	1
OG	2	0
SHM	1	0
WC	1	0
Male	N/A	2

\

Total HOLD LUMBAR directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	1	0
	OG	1	0
	SHM	0	0
	WC	0	0
	Male	N/A	0
BBBG2	OBN	0	0
OG		0	0
SHM		1	0
WC		1	0
Male		N/A	0

Total HOLD LUMBAR events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	1	0
OG	1	0
SHM	1	0
WC	1	0
Male	N/A	0

\

Total APPROACH(WALK)-RETREAT directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	0	0
	OG	3	0
	SHM	0	0
	WC	0	0
	Male	N/A	0
BBBG2	OBN	2	0
OG		1	0
SHM		1	0
WC		2	2
Male		N/A	10

Total APPROACH(WALK)-RETREAT events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	2	0
OG	4	0
SHM	1	0
WC	2	2
Male	N/A	10

\

Total CHASE directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	0	0
	OG	0	0
	SHM	0	0
	WC	1	0
	Male	N/A	1
BBBG2	OBN	1	0
OG		0	0
SHM		0	0
WC		0	0
Male		N/A	0

Total CHASE events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	1	0
OG	0	0
SHM	0	0
WC	1	0
Male	N/A	1

\

Total WRESTLE directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	0	0
	OG	0	0
	SHM	0	0
	WC	0	2
	Male	N/A	1
BBBG2	OBN	0	0
OG		0	0
SHM		0	0
WC		1	1
Male		N/A	0

Total WRESTLE events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OG	0	0
SHM	0	0
WC	1	3
Male	N/A	1

\

Total ADJACENT WIRE WALL directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	0	0
	OG	0	0
	SHM	0	0
	WC	0	0
	Male	N/A	0
BBBG2	OBN	0	0
OG		1	0
SHM		0	0
WC		0	0
Male		N/A	0

Total ADJACENT WIRE WALL events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OG	1	0
SHM	0	0
WC	0	0
Male	N/A	0

\

Total ADJACENT BOX PROXIMITY directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	0	0
	OG	0	0
	SHM	0	0
	WC	3	0
	Male	N/A	0
BBBG2	OBN	0	0
OG		1	0
SHM		0	0
WC		2	0
Male		N/A	0

Total ADJACENT BOX PROXIMITY events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OG	1	1
SHM	0	0
WC	5	0
Male	N/A	0

\

Total STEAL FOOD directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	0	0
	OG	1	1
	SHM	0	0
	WC	1	0
	Male	N/A	0
BBBG2	OBN	0	0
OG		0	0
SHM		0	0
WC		0	0
Male		N/A	0

Total STEAL FOOD events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OG	1	1
SHM	0	0
WC	1	0
Male	N/A	0

\

Total LUNGE directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	0	0
	OG	1	0
	SHM	0	0
	WC	0	0
	Male	N/A	0
BBBG2	OBN	0	0
OG		0	0
SHM		0	0
WC		0	1
Male		N/A	0

Total LUNGE events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OG	1	0
SHM	0	0
WC	0	1
Male	N/A	0

\

Total HAND SWIPE directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	0	0
	OG	0	0
	SHM	0	0
	WC	0	0
	Male	N/A	0
BBBG2	OBN	0	0
OG		0	0
SHM		0	0
WC		1	1
Male		N/A	0

Total HAND SWIPE events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OG	0	0
SHM	0	0
WC	1	1
Male	N/A	0

\

Total ARM GRAB directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	0	0
	OG	0	0
	SHM	0	0
	WC	2	0
	Male	N/A	0
BBBG2	OBN	0	0
OG		0	0
SHM		0	0
WC		0	0
Male		N/A	0

Total ARM GRAB events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OG	0	0
SHM	0	0
WC	2	0
Male	N/A	0

\

Total FUR GRAB directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	0	0
	OG	0	0
	SHM	0	0
	WC	1	0
	Male	N/A	0
BBBG2	OBN	0	0
OG		0	0
SHM		0	0
WC		0	0
Male		N/A	0

Total FUR GRAB events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OG	0	0
SHM	0	0
WC	1	0
Male	N/A	0

\

Total HEAD PULL directional events for OBN.

Initiator	Recipient	Events scored	
		Without male	With Male
OBN	BBBG2	0	0
	OG	0	0
	SHM	0	0
	WC	6	0
	Male	N/A	0
BBBG2	OBN	0	0
OG		0	0
SHM		0	0
WC		0	0
Male		N/A	0

Total HEAD PULL events for OBN.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OG	0	0
SHM	0	0
WC	6	0
Male	N/A	0

\

Appendix 2: Breakdown of OG behavioural events

Self groom: Periods when male was not present: 19, **Period when male was present:** 10

Total directional events for OG.

Initiator	**Recipient**	**Events scored**	
		Without male	**With Male**
OG	BBBG2	48	47
	OBN	28	11
	SHM	53	24
	WC	42	30
	Male	N/A	3
BBBG2	OG	22	24
OBN		31	11
SHM		15	20
WC		22	11
Male		N/A	12

Total events for OG.

Partner	**Events scored**	
	Without male	**With Male**
BBBG2	79	79
OBN	59	22
SHM	75	47
WC	73	44
Male	N/A	18

Total directional AFFILATIVE events for OG.

Initiator	Recipient	Events scored	
		Without male	**With Male**
OG	BBBG2	47	47
	OBN	28	11
	SHM	51	24
	WC	42	29
	Male	N/A	2
BBBG2	OG	21	24
OBN		28	11
SHM		15	20
WC		22	11
Male		N/A	5

Total AFFILATIVE events for OG.

Partner	Events scored	
	Without male	**With Male**
BBBG2	77	79
OBN	56	22
SHM	73	47
WC	73	43
Male	N/A	10

Total directional AGONISITIC events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	1	0
	OBN	0	0
	SHM	0	0
	WC	0	1
	Male	N/A	1
BBBG2	OG	0	0
OBN		3	0
SHM		0	0
WC		0	0
Male		N/A	7

Total AGONISITIC events for OG.

Partner	Events scored	
	Without male	With Male
BBBG2	1	0
OBN	3	0
SHM	0	0
WC	0	1
Male	N/A	8

Total OTHER directional events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	0	0
	OBN	0	0
	SHM	2	0
	WC	0	0
	Male	N/A	0
BBBG2	OG	1	0
OBN		0	0
SHM		0	0
WC		0	0
Male		N/A	0

Total OTHER events for OG.

Partner	Events scored	
	Without male	With Male
BBBG2	1	0
OBN	0	0
SHM	2	0
WC	0	0
Male	N/A	0

Total directional GLANCE events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	53	20
	OBN	65	38
	SHM	46	11
	WC	39	16
	Male	N/A	45

Total directional STARE events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	0	0
	OBN	0	4
	SHM	0	0
	WC	0	0
	Male	N/A	1

Total LESSER BODY CONTACT directional events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	4	6
	OBN	2	1
	SHM	4	1
	WC	3	3
	Male	N/A	0
BBBG2	OG	0	1
OBN		0	0
SHM		0	4
WC		0	1
Male		N/A	0

Total LESSER BODY CONTACT events for OG.

Partner	Events scored	
	Without male	With Male
BBBG2	8	9
OBN	2	1
SHM	5	6
WC	6	4
Male	N/A	0

Total directional GREATER BODY CONTACT events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	2	1
	OBN	0	1
	SHM	2	5
	WC	1	3
	Male	N/A	0
BBBG2	OG	0	3
OBN		0	0
SHM		1	3
WC		2	0
Male		N/A	0

Total GREATER BODY CONTACT events for OG.

Partner	Events scored	
	Without male	With Male
BBBG2	3	4
OBN	0	1
SHM	5	7
WC	4	3
Male	N/A	0

Total directional PROXIMITY events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	29	30
	OBN	22	8
	SHM	34	13
	WC	27	15
	Male	N/A	3
BBBG2	OG	12	16
OBN		22	7
SHM		11	12
WC		8	6
Male		N/A	3

Total PROXIMITY events for OG.

Partner	Events scored	
	Without male	With Male
BBBG2	45	52
OBN	44	15
SHM	48	27
WC	38	24
Male	N/A	6

Total directional WITHIN BOX PROXIMITY events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	0	0
	OBN	0	0
	SHM	0	0
	WC	0	0
	Male	N/A	0
BBBG2	OG	0	0
OBN		0	0
SHM		0	0
WC		0	0
Male		N/A	0

Total WITHIN BOX PROXIMITY events for OG.

Partner	Events scored	
	Without male	With Male
BBBG2	1	0
OBN	0	0
SHM	0	0
WC	1	0
Male	N/A	0

Total directional SINGLE GROOM events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	9	8
	OBN	0	0
	SHM	10	3
	WC	5	4
	Male	N/A	0
BBBG2	OG	8	4
OBN		5	3
SHM		1	3
WC		5	0
Male		N/A	1

Total SINGLE GROOM events for OG.

Partner	Events scored	
	Without male	With Male
BBBG2	17	12
OBN	5	3
SHM	11	3
WC	10	4
Male	N/A	1

Total directional ADJACENT BOX PROXIMITY events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	1	0
	OBN	2	1
	SHM	0	2
	WC	1	4
	Male	N/A	2
BBBG2	OG	0	0
OBN		0	0
SHM		0	1
WC		1	3
Male		N/A	1

Total ADJACENT BOX PROXIMITY events for OG.

Partner	Events scored	
	Without male	With Male
BBBG2	1	0
OBN	2	1
SHM	0	3
WC	3	7
Male	N/A	3

Total directional HOLD LUMBAR events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	2	0
	OBN	0	0
	SHM	0	0
	WC	0	0
	Male	N/A	0
BBBG2	OG	0	0
OBN		0	0
SHM		0	0
WC		0	0
Male		N/A	0

Total HOLD LUMBAR events for OG.

Partner	Events scored	
	Without male	With Male
BBBG2	2	0
OBN	0	0
SHM	0	0
WC	0	0
Male	N/A	0

Total directional RECIPROCAL GROOM events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	2	0
	OBN	2	0
	SHM	1	0
	WC	5	0
	Male	N/A	0
BBBG2	OG	0	0
OBN		1	0
SHM		2	0
WC		5	1
Male		N/A	0

Total RECIPROCAL GROOM events for OG.

Partner	Events scored	
	Without male	With Male
BBBG2	2	0
OBN	3	0
SHM	3	0
WC	10	1
Male	N/A	0

Total directional APPROACH(WALK)-RETREAT events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	1	0
	OBN	0	0
	SHM	0	0
	WC	0	0
	Male	N/A	0
BBBG2	OG	0	0
OBN		1	0
SHM		0	0
WC		0	1
Male		N/A	7

Total APPROACH(WALK)-RETREAT events for OG.

Partner	Events scored	
	Without male	With Male
BBBG2	1	0
OBN	1	0
SHM	0	0
WC	0	1
Male	N/A	7

Total directional TAIL GRAB events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	0	0
	OBN	0	0
	SHM	0	0
	WC	0	0
	Male	N/A	0
BBBG2	OG	1	0
OBN		0	0
SHM		0	0
WC		0	0
Male		N/A	0

Total TAIL GRAB events for OG.

Partner	Events scored	
	Without male	With Male
BBBG2	1	0
OBN	0	0
SHM	0	0
WC	0	0
Male	N/A	0

Total directional ARM GRAB events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	0	0
	OBN	0	0
	SHM	1	0
	WC	0	0
	Male	N/A	0
BBBG2	OG	0	0
OBN		0	0
SHM		0	0
WC		0	0
Male		N/A	0

Total ARM GRAB events for OG.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OBN	0	0
SHM	1	0
WC	0	0
Male	N/A	0

Total directional HEAD BUTTING events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	0	0
	OBN	0	0
	SHM	1	0
	WC	0	0
	Male	N/A	0
BBBG2	OG	0	0
OBN		0	0
SHM		0	0
WC		0	0
Male		N/A	0

Total HEAD BUTTING events for OG.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OBN	0	0
SHM	1	0
WC	0	0
Male	N/A	0

Total directional LUNGE events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	0	0
	OBN	0	0
	SHM	0	0
	WC	0	0
	Male	N/A	0
BBBG2	OG	0	0
OBN		1	0
SHM		0	0
WC		0	0
Male		N/A	0

Total LUNGE events for OG.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OBN	1	0
SHM	0	0
WC	0	0
Male	N/A	0

Total directional HAND SWIPE events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	0	0
	OBN	0	0
	SHM	0	0
	WC	0	0
	Male	N/A	0
BBBG2	OG	0	0
OBN		1	0
SHM		0	0
WC		0	0
Male		N/A	0

Total HAND SWIPE events for OG.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OBN	1	0
SHM	0	0
WC	0	0
Male	N/A	0

Total directional WRESTLE events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	0	0
	OBN	0	0
	SHM	0	0
	WC	0	1
	Male	N/A	0
BBBG2	OG	0	0
OBN		0	0
SHM		0	0
WC		0	0
Male		N/A	0

Total WRESTLE events for OG.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OBN	0	0
SHM	0	0
WC	0	0
Male	N/A	1

Total directional EMBRACE events for OG.

Initiator	Recipient	Events scored	
		Without male	With Male
OG	BBBG2	0	0
	OBN	0	0
	SHM	0	0
	WC	0	0
	Male	N/A	0
BBBG2	OG	0	0
OBN		0	1
SHM		0	0
WC		1	0
Male		N/A	0

Total EMBRACE events for OG.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OBN	0	1
SHM	0	0
WC	1	0
Male	N/A	0

Appendix 2: Breakdown of SHM behavioural events

Self groom: Periods when male was not present: 16, Period when male was present: 1

Total directional events for SHM.

Initiator	Recipient	Events scored	
		Without male	With Male
SHM	BBBG2	65	7
	OBN	25	1
	OG	39	3
	WC	51	2
	Male	N/A	3
BBBG2	SHM	70	11
OBN		32	3
OG		64	6
WC		40	2
Male		N/A	2

Total events for SHM.

Partner	Events scored	
	Without male	With Male
BBBG2	155	24
OBN	63	4
OG	111	10
WC	108	4
Male	N/A	5

\

Total directional AFFILATIVE events for SHM.

Initiator	Recipient	Events scored	
		Without male	With Male
SHM	BBBG2	64	7
	OBN	23	1
	OG	37	3
	WC	50	2
	Male	N/A	3
BBBG2	SHM	69	10
OBN		30	3
OG		64	6
WC		40	2
Male		N/A	1

Total AFFIALTIVE events for SHM.

Partner	Events scored	
	Without male	With Male
BBBG2	153	22
OBN	59	4
OG	109	10
WC	107	4
Male	N/A	4

\

Total directional AGONISITIC events for SHM.

Initiator	Recipient	Events scored	
		Without male	With Male
SHM	BBBG2	0	0
	OBN	2	0
	OG	1	0
	WC	0	0
	Male	N/A	0
BBBG2	SHM	1	1
OBN		2	0
OG		0	0
WC		0	0
Male		N/A	1

Total AGONISITIC events for SHM.

Partner	Events scored	
	Without male	With Male
BBBG2	1	2
OBN	4	0
OG	1	0
WC	0	0
Male	N/A	1

\

Total directional OTHER events for SHM.

Initiator	Recipient	Events scored	
		Without male	With Male
SHM	BBBG2	1	0
	OBN	0	0
	OG	1	0
	WC	1	0
	Male	N/A	0
BBBG2	SHM	0	0
OBN		0	0
OG		0	0
WC		0	0
Male		N/A	0

Total OTHER events for SHM.

Partner	Events scored	
	Without male	With Male
BBBG2	1	0
OBN	0	0
OG	1	0
WC	1	0
Male	N/A	0

\

Total directional GLANCE events for SHM.

Initiator	Recipient	Events scored	
		Without male	With Male
SHM	BBBG2	99	4
	OBN	100	5
	OG	96	2
	WC	70	6
	Male	N/A	5

Total directional LESSER BODY CONTACT events for SHM.

Initiator	Recipient	Events scored	
		Without male	With Male
SHM	BBBG2	7	0
	OBN	1	0
	OG	7	0
	WC	2	0
	Male	N/A	0
BBBG2	SHM	5	2
OBN		2	0
OG		3	1
WC		3	0
Male		N/A	0

\

Total LESSER BODY CONTACT events for SHM.

Partner	Events scored	
	Without male	With Male
BBBG2	19	3
OBN	5	0
OG	11	1
WC	8	0
Male	N/A	0

Total directional GREATER BODY CONTACT events for SHM.

Initiator	Recipient	Events scored	
		Without male	With Male
SHM	BBBG2	5	2
	OBN	0	0
	OG	0	0
	WC	0	0
	Male	N/A	0
BBBG2	SHM	2	0
OBN		1	0
OG		1	1
WC		0	0
Male		N/A	0

\

Total GREATER BODY CONTACT events for SHM.

Partner	Events scored	
	Without male	With Male
BBBG2	7	2
OBN	1	0
OG	1	1
WC	3	0
Male	N/A	0

Total directional PROXIMITY events for SHM.

Initiator	Recipient	Events scored	
		Without male	With Male
SHM	BBBG2	44	3
	OBN	15	0
	OG	19	3
	WC	34	2
	Male	N/A	3
BBBG2	SHM	47	7
OBN		15	3
OG		37	2
WC		22	2
Male		N/A	1

\

Total PROXIMITY events for SHM.

Partner	Events scored	
	Without male	With Male
BBBG2	104	13
OBN	34	3
OG	63	5
WC	63	4
Male	N/A	4

Total directional WITHIN BOX PROXIMITY events for SHM.

Initiator	Recipient	Events scored	
		Without male	With Male
SHM	BBBG2	1	0
	OBN	0	0
	OG	1	0
	WC	1	0
	Male	N/A	0
BBBG2	SHM	0	0
OBN		0	0
OG		0	0
WC		0	0
Male		N/A	0

\

Total WITHIN BOX PROXIMITY events for SHM.

Partner	Events scored	
	Without male	With Male
BBBG2	1	1
OBN	0	1
OG	1	1
WC	1	0
Male	N/A	0

Total directional SINGLE GROOM events for SHM.

Initiator	Recipient	Events scored	
		Without male	With Male
SHM	BBBG2	6	1
	OBN	4	0
	OG	3	0
	WC	7	0
	Male	N/A	0
BBBG2	SHM	15	1
OBN		7	0
OG		16	2
WC		11	0
Male		N/A	0

\

Total SINGLE GROOM events for SHM.

<table>
<tr><th rowspan="2">Partner</th><th colspan="2">Events scored</th></tr>
<tr><th>Without male</th><th>With Male</th></tr>
<tr><td>BBBG2</td><td>21</td><td>2</td></tr>
<tr><td>OBN</td><td>11</td><td>0</td></tr>
<tr><td>OG</td><td>19</td><td>2</td></tr>
<tr><td>WC</td><td>18</td><td>0</td></tr>
<tr><td>Male</td><td>N/A</td><td>0</td></tr>
</table>

Total directional HOLD LUMBAR events for SHM.

<table>
<tr><th rowspan="2">Initiator</th><th rowspan="2">Recipient</th><th colspan="2">Events scored</th></tr>
<tr><th>Without male</th><th>With Male</th></tr>
<tr><td rowspan="5">SHM</td><td>BBBG2</td><td>1</td><td>0</td></tr>
<tr><td>OBN</td><td>0</td><td>0</td></tr>
<tr><td>OG</td><td>0</td><td>0</td></tr>
<tr><td>WC</td><td>0</td><td>0</td></tr>
<tr><td>Male</td><td>N/A</td><td>0</td></tr>
<tr><td>BBBG2</td><td rowspan="5">SHM</td><td>0</td><td>0</td></tr>
<tr><td>OBN</td><td>0</td><td>0</td></tr>
<tr><td>OG</td><td>0</td><td>0</td></tr>
<tr><td>WC</td><td>0</td><td>0</td></tr>
<tr><td>Male</td><td>N/A</td><td>0</td></tr>
</table>

\

Total HOLD LUMBAR events for SHM.

Partner	Events scored	
	Without male	With Male
BBBG2	1	0
OBN	0	0
OG	0	0
WC	0	0
Male	N/A	0

Total directional WRESTLE events for SHM.

Initiator	Recipient	Events scored	
		Without male	With Male
SHM	BBBG2	0	0
	OBN	0	0
	OG	0	0
	WC	0	0
	Male	N/A	0
BBBG2	SHM	0	0
OBN		0	0
OG		0	0
WC		0	0
Male		N/A	0

\

Total WRESTLE events for SHM.

Partner	Events scored	
	Without male	With Male
BBBG2	0	1
OBN	0	0
OG	0	0
WC	0	0
Male	N/A	0

Total directional APPROACH(WALK)-RETREAT events for SHM.

Initiator	Recipient	Events scored	
		Without male	With Male
SHM	BBBG2	0	0
	OBN	0	0
	OG	1	0
	WC	0	0
	Male	N/A	0
BBBG2	SHM	1	0
OBN		0	0
OG		0	0
WC		0	0
Male		N/A	0

\

Total APPROACH(WALK)-RETREAT events for SHM.

Partner	Events scored	
	Without male	With Male
BBBG2	1	0
OBN	0	0
OG	1	0
WC	0	0
Male	N/A	0

Total directional CHASE events for SHM.

Initiator	Recipient	Events scored	
		Without male	With Male
SHM	BBBG2	0	0
	OBN	1	0
	OG	0	0
	WC	0	0
	Male	N/A	0
BBBG2	SHM	0	1
OBN		0	0
OG		0	0
WC		0	0
Male		N/A	1

\

Total CHASE events for SHM.

Partner	Events scored	
	Without male	With Male
BBBG2	0	1
OBN	1	0
OG	0	0
WC	0	0
Male	N/A	1

Total directional ADJACENT BOX PROXIMITY events for SHM.

Initiator	Recipient	Events scored	
		Without male	With Male
SHM	BBBG2	0	0
	OBN	1	0
	OG	0	0
	WC	1	0
	Male	N/A	0
BBBG2	SHM	0	0
OBN		1	0
OG		0	0
WC		0	0
Male		N/A	0

\

Total ADJACENT BOX PROXIMITY events for SHM.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OBN	2	0
OG	0	0
WC	1	0
Male	N/A	0

Total directional RECIPROCAL GROOM events for SHM.

Initiator	Recipient	Events scored	
		Without male	With Male
SHM	BBBG2	0	0
	OBN	2	0
	OG	6	0
	WC	5	0
	Male	N/A	0
BBBG2	SHM	0	0
OBN		4	0
OG		6	0
WC		3	0
Male		N/A	0

\

Total RECIPROCAL GROOM events for SHM.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OBN	6	0
OG	12	0
WC	8	0
Male	N/A	0

Total directional STEAL FOOD events for SHM.

Initiator	Recipient	Events scored	
		Without male	With Male
SHM	BBBG2	0	0
	OBN	1	0
	OG	0	0
	WC	0	0
	Male	N/A	0
BBBG2	SHM	0	0
OBN		2	0
OG		0	0
WC		0	0
Male		N/A	0

\

Total STEAL FOOD events for SHM.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OBN	3	0
OG	0	0
WC	0	0
Male	N/A	0

Total directional ARM GRAB events for SHM.

Initiator	Recipient	Events scored	
		Without male	With Male
SHM	BBBG2	0	0
	OBN	0	0
	OG	1	0
	WC	0	0
	Male	N/A	0
BBBG2	SHM	0	0
OBN		0	0
OG		0	0
WC		0	0
Male		N/A	0

\

Total ARM GRAB events for SHM.

Partner	Events scored	
	Without male	**With Male**
BBBG2	0	0
OBN	0	0
OG	1	0
WC	0	0
Male	N/A	0

Total directional HEAD PULL events for SHM.

<table>
<tr><th rowspan="2">Initiator</th><th rowspan="2">Recipient</th><th colspan="2">Events scored</th></tr>
<tr><th>Without male</th><th>With Male</th></tr>
<tr><td rowspan="5">SHM</td><td>BBBG2</td><td>0</td><td>0</td></tr>
<tr><td>OBN</td><td>0</td><td>0</td></tr>
<tr><td>OG</td><td>0</td><td>0</td></tr>
<tr><td>WC</td><td>1</td><td>0</td></tr>
<tr><td>Male</td><td>N/A</td><td>0</td></tr>
<tr><td>BBBG2</td><td rowspan="5">SHM</td><td>0</td><td>0</td></tr>
<tr><td>OBN</td><td>0</td><td>0</td></tr>
<tr><td>OG</td><td>0</td><td>0</td></tr>
<tr><td>WC</td><td>0</td><td>0</td></tr>
<tr><td>Male</td><td>N/A</td><td>0</td></tr>
</table>

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Total HEAD PULL events for SHM.

Partner	Events scored	
	Without male	With Male
BBBG2	0	0
OBN	0	0
OG	0	0
WC	1	0
Male	N/A	0

Total directional TAIL GRAB events for SHM.

Initiator	Recipient	Events scored	
		Without male	With Male
SHM	BBBG2	1	0
	OBN	0	0
	OG	0	0
	WC	0	0
	Male	N/A	0
BBBG2	SHM	0	0
OBN		0	0
OG		0	0
WC		0	0
Male		N/A	0

\

Total TAIL GRAB events for SHM.

Partner	Events scored	
	Without male	With Male
BBBG2	1	0
OBN	0	0
OG	0	0
WC	0	0
Male	N/A	0

Total directional EMBRACE events for SHM.

Initiator	Recipient	Events scored	
		Without male	With Male
SHM	BBBG2	0	0
	OBN	0	0
	OG	1	0
	WC	0	0
	Male	N/A	0
BBBG2	SHM	0	0
OBN		0	0
OG		1	0
WC		1	0
Male		N/A	0

\

Total EMBRACE events for SHM.

Partner	Events scored	
	Without male	**With Male**
BBBG2	0	0
OBN	0	0
OG	2	0
WC	5	0
Male	N/A	0

\

Appendix 2: Breakdown of BBBG2 behavioural events

Self groom: Periods when male was not present: 32, **Period when male was present:** 10

Total directional events for BBBG2.

Initiator	Recipient	Events scored	
		Without male	With Male
BBBG2	OBN	17	8
	OG	30	6
	SHM	60	26
	WC	31	8
	Male	N/A	1
OBN	BBBG2	9	12
OG		44	16
SHM		43	13
WC		15	7
Male		N/A	4

Total events for BBBG2.

Partner	Events scored	
	Without male	With Male
OBN	29	24
OG	83	31
SHM	129	51
WC	51	25
Male	N/A	9

Total AFFILATIVE directional events for BBBG2.

Initiator	Recipient	Events scored	
		Without male	With Male
BBBG2	OBN	16	8
	OG	29	6
	SHM	60	25
	WC	29	8
	Male	N/A	1
OBN	BBBG2	9	12
OG		44	16
SHM		43	13
WC		15	7
Male		N/A	4

Total AFFILATIVE events for BBBG2.

Partner	Events scored	
	Without male	With Male
OBN	28	24
OG	82	31
SHM	129	50
WC	49	25
Male	N/A	5

Total AGONISITIC directional events for BBBG2.

Initiator	Recipient	Events scored	
		Without male	With Male
BBBG2	OBN	1	0
	OG	1	0
	SHM	0	0
	WC	1	0
	Male	N/A	2
OBN	BBBG2	0	0
OG		0	0
SHM		0	0
WC		0	0
Male		N/A	1

Total AGONISITIC events for BBBG2.

Partner	Events scored	
	Without male	With Male
OBN	1	0
OG	1	0
SHM	0	0
WC	1	0
Male	N/A	4

Total OTHER directional events for BBBG2.

Initiator	Recipient	Events scored	
		Without male	With Male
BBBG2	OBN	0	0
	OG	0	0
	SHM	0	1
	WC	1	0
	Male	N/A	0
OBN	BBBG2	0	0
OG		0	0
SHM		0	0
WC		0	0
Male		N/A	0

Total OTHER events for BBBG2.

Partner	Events scored	
	Without male	With Male
OBN	0	0
OG	0	0
SHM	0	1
WC	1	0
Male	N/A	0

Total APPROACH(WALK) –RETREAT directional events for BBBG2.

Initiator	Recipient	Events scored	
		Without male	With Male
BBBG2	OBN	1	0
	OG	1	0
	SHM	0	0
	WC	1	0
	Male	N/A	0
OBN	BBBG2	0	0
OG		0	0
SHM		0	0
WC		0	0
Male		N/A	1

Total APPROACH(WALK)- RETREAT events for BBBG2.

Partner	Events scored	
	Without male	With Male
OBN	1	0
OG	1	0
SHM	0	0
WC	1	0
Male	N/A	1

Total LESSER BODY CONTACT directional events for BBBG2.

Initiator	Recipient	Events scored	
		Without male	With Male
BBBG2	OBN	1	1
	OG	2	1
	SHM	5	1
	WC	1	0
	Male	N/A	0
OBN	BBBG2	0	1
OG		1	2
SHM		8	2
WC		0	1
Male		N/A	0

Total LESSER BODY CONTACT events for BBBG2.

Partner	Events scored	
	Without male	With Male
OBN	1	2
OG	6	3
SHM	24	3
WC	2	1
Male	N/A	0

Total GREATER BODY CONTACT directional events for BBBG2.

Initiator	Recipient	Events scored	
		Without male	With Male
BBBG2	OBN	2	0
	OG	0	0
	SHM	2	1
	WC	0	0
	Male	N/A	0
OBN	BBBG2	0	2
OG		2	0
SHM		3	0
WC		1	0
Male		N/A	0

Total GREATER BODY CONTACT events for BBBG2.

Partner	Events scored	
	Without male	With Male
OBN	2	2
OG	2	0
SHM	6	1
WC	1	0
Male	N/A	0

Total BOX PROXIMITY directional events for BBBG2.

Initiator	Recipient	Events scored	
		Without male	With Male
BBBG2	OBN	0	2
	OG	0	1
	SHM	0	2
	WC	0	2
	Male	N/A	0
OBN	BBBG2	0	1
OG		0	1
SHM		0	3
WC		0	0
Male		N/A	0

Total BOX PROXIMITY events for BBBG2 .

Partner	Events scored	
	Without male	With Male
OBN	0	7
OG	0	6
SHM	0	10
WC	0	7
Male	N/A	0

Total EMBRACE directional events for BBBG2.

Initiator	Recipient	Events scored	
		Without male	With Male
BBBG2	OBN	0	0
	OG	0	0
	SHM	0	0
	WC	2	0
	Male	N/A	0
OBN	BBBG2	0	0
OG		0	0
SHM		1	0
WC		1	0
Male		N/A	0

Total EMBRACE events for BBBG2 .

Partner	Events scored	
	Without male	With Male
OBN	0	0
OG	0	0
SHM	1	0
WC	4	0
Male	N/A	0

Total FUR GRAB directional events for BBBG2.

Initiator	Recipient	Events scored	
		Without male	With Male
BBBG2	OBN	0	0
	OG	0	0
	SHM	0	0
	WC	1	0
	Male	N/A	0
OBN	BBBG2	0	0
OG		0	0
SHM		0	0
WC		0	0
Male		N/A	0

Total FUR GRAB events for BBBG2.

Partner	Events scored	
	Without male	With Male
OBN	0	0
OG	0	0
SHM	0	0
WC	1	0
Male	N/A	0

Total GLANCE directional events for BBBG2.

Initiator	Recipient	Events scored	
		Without male	With Male
BBBG2	OBN	55	15
	OG	59	10
	SHM	68	23
	WC	43	17
	Male	N/A	28

Total SINGLE GROOM directional events for BBBG2.

Initiator	Recipient	Events scored	
		Without male	With Male
BBBG2	OBN	1	0
	OG	12	0
	SHM	10	1
	WC	6	1
	Male	N/A	0
OBN	BBBG2	1	1
OG		14	1
SHM		5	0
WC		1	0
Male		N/A	0

Total SINGLE GROOM events for BBBG2.

Partner	Events scored	
	Without male	With Male
OBN	2	1
OG	26	1
SHM	15	1
WC	7	1
Male	N/A	0

Total HOLD LUMBAR directional events for BBBG2.

Initiator	Recipient	Events scored	
		Without male	With Male
BBBG2	OBN	1	0
	OG	0	0
	SHM	1	0
	WC	0	0
	Male	N/A	0
OBN	BBBG2	0	0
OG		0	0
SHM		0	0
WC		0	0
Male		N/A	0

Total HOLD LUMBAR events for BBBG2.

Partner	Events scored	
	Without male	With Male
OBN	1	0
OG	0	0
SHM	1	0
WC	0	0
Male	N/A	0

Total PROXIMITY directional events for BBBG2.

Initiator	Recipient	Events scored	
		Without male	With Male
BBBG2	OBN	11	5
	OG	15	4
	SHM	40	20
	WC	20	5
	Male	N/A	1
OBN	BBBG2	7	7
OG		27	12
SHM		24	8
WC		12	6
Male		N/A	4

Total PROXIMITY events for BBBG2.

Partner	Events scored	
	Without male	With Male
OBN	21	12
OG	48	17
SHM	78	30
WC	35	11
Male	N/A	5

Total RECIPROCAL GROOM directional events for BBBG2.

Initiator	Recipient	Events scored	
		Without male	With Male
BBBG2	OBN	0	0
	OG	0	0
	SHM	2	0
	WC	0	0
	Male	N/A	0
OBN	BBBG2	1	0
OG		0	0
SHM		2	0
WC		0	0
Male		N/A	0

Total RECIPROCAL GROOM events for BBBG2.

Partner	Events scored	
	Without male	With Male
OBN	1	0
OG	0	0
SHM	4	0
WC	0	0
Male	N/A	0

Total STARE directional events for BBBG2.

Initiator	Recipient	Events scored	
		Without male	With Male
BBBG2	OBN	1	0
	OG	0	0
	SHM	0	0
	WC	1	0
	Male	N/A	0

Total TAIL GRAB directional events for BBBG2.

Initiator	Recipient	Events scored	
		Without male	With Male
BBBG2	OBN	0	0
	OG	0	0
	SHM	0	1
	WC	0	0
	Male	N/A	0
OBN	BBBG2	0	0
OG		0	0
SHM		0	0
WC		0	0
Male		N/A	0

Total TAIL GRAB events for BBBG2.

Partner	Events scored	
	Without male	With Male
OBN	0	0
OG	0	0
SHM	0	1
WC	0	0
Male	N/A	0

Appendix 2: Breakdown of BD behavioural events

Self groom: **Period before 2006 birth season:** 28, **Period after 2006 birth season:** 24

Copulation: Period before 2006 birth season: 0, **Period after 2006 birth season:** 0

Total directional events for YZM.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
YZM	BD	5	0
	JB	2	2
	XBC	15	20
	DBC	1	3
	YL	0	15
	XK	12	6
	FEMALE	2	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YZM	1	3
JB		15	4
XBC		7	8
DBC		2	18
YL		9	5
XK		4	5
FEMALE		4	0
SUBADULT		2	0
UNKNOWN		0	0

Total events for YZM.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	6	4
JB	19	6
XBC	31	34
DBC	4	23
YL	10	30
XK	30	17
FEMALE	6	0
SUBADULT	2	0
UNKNOWN	0	0

Total directional AFFILATIVE events for YZM.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YZM	BD	5	0
	JB	1	2
	XBC	14	20
	DBC	0	3
	YL	0	15
	XK	12	6
	FEMALE	2	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YZM	0	3
JB		12	3
XBC		7	8
DBC		1	18
YL		4	5
XK		4	4
FEMALE		3	0
SUBADULT		2	0
UNKNOWN		0	0

Total AFFILATIVE events for YZM.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	5	4
JB	15	5
XBC	30	34
DBC	2	23
YL	5	30
XK	30	16
FEMALE	5	0
SUBADULT	2	0
UNKNOWN	0	0

Total directional AGONISITIC events for YZM.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YZM	BD	0	0
	JB	1	0
	XBC	1	0
	DBC	1	0
	YL	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YZM	1	0
JB		2	1
XBC		0	0
DBC		0	0
YL		3	0
XK		0	1
FEMALE		1	0
SUBADULT		0	0
UNKNOWN		0	0

Total AGONISITIC events for YZM.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	1	0
JB	3	1
XBC	1	0
DBC	1	0
YL	3	0
XK	0	1
FEMALE	1	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional OTHER events for YZM.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YZM	BD	0	0
	JB	0	0
	XBC	0	0
	DBC	0	0
	YL	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YZM	0	0
JB		1	0
XBC		0	0
DBC		1	0
YL		2	0
XK		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total OTHER events for YZM.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
JB	1	0
XBC	0	0
DBC	1	0
YL	2	0
XK	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional PROXIMITY events for YZM.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YZM	BD	5	0
	JB	1	0
	XBC	3	2
	DBC	0	1
	YL	0	5
	XK	2	1
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YZM	0	1
JB		10	2
XBC		1	5
DBC		1	11
YL		4	1
XK		0	1
FEMALE		2	0
SUBADULT		0	0
UNKNOWN		0	0

Total PROXIMITY events for YZM.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	5	2
JB	13	2
XBC	6	9
DBC	2	13
YL	5	7
XK	3	4
FEMALE	2	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional GREATER BODY CONTACT events for YZM.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YZM	BD	0	0
	JB	0	0
	XBC	0	4
	DBC	0	0
	YL	0	2
	XK	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YZM	0	1
JB		0	0
XBC		0	0
DBC		0	2
YL		0	0
XK		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total GREATER BODY CONTACT events for YZM.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	1
JB	0	0
XBC	0	6
DBC	0	3
YL	0	7
XK	5	3
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional LESSER BODY CONTACT events for YZM.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YZM	BD	0	0
	JB	0	0
	XBC	0	0
	DBC	0	0
	YL	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YZM	0	0
JB		0	0
XBC		1	1
DBC		0	0
YL		0	0
XK		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total LESSER BODY CONTACT events for YZM.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
JB	0	0
XBC	6	3
DBC	0	0
YL	0	2
XK	5	1
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional SINGLE GROOM events for YZM.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YZM	BD	0	0
	JB	0	1
	XBC	10	13
	DBC	0	1
	YL	0	7
	XK	9	4
	FEMALE	1	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YZM	0	1
JB		1	0
XBC		4	2
DBC		0	4
YL		0	4
XK		1	1
FEMALE		0	0
SUBADULT		2	0
UNKNOWN		0	0

Total SINGLE GROOM events for YZM.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	1
JB	1	1
XBC	14	15
DBC	0	5
YL	0	11
XK	10	5
FEMALE	1	0
SUBADULT	2	0
UNKNOWN	0	0

Total directional RECIPROCAL GROOM events for YZM.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YZM	BD	0	0
	JB	0	0
	XBC	1	0
	DBC	0	1
	YL	0	1
	XK	1	0
	FEMALE	1	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YZM	0	0
JB		0	0
XBC		1	0
DBC		0	1
YL		0	0
XK		3	2
FEMALE		1	0
SUBADULT		0	0
UNKNOWN		0	0

Total RECIPROCAL GROOM events for YZM.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
JB	0	0
XBC	2	0
DBC	0	2
YL	0	1
XK	4	2
FEMALE	2	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional EMBRACE events for YZM.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YZM	BD	0	0
	JB	0	0
	XBC	0	0
	DBC	0	0
	YL	0	0
	XK	0	1
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YZM	0	0
JB		0	0
XBC		0	0
DBC		0	0
YL		0	0
XK		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total EMBRACE events for YZM.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
JB	0	0
XBC	2	0
DBC	0	0
YL	0	2
XK	3	1
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional APPROACH(WALK)-RETREAT events for YZM.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YZM	BD	0	0
	JB	0	0
	XBC	1	0
	DBC	0	0
	YL	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YZM	0	0
JB		2	1
XBC		0	0
DBC		0	0
YL		2	0
XK		0	1
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total APPROACH(WALK)-RETREAT events for YZM.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
JB	2	1
XBC	1	0
DBC	0	0
YL	2	0
XK	0	1
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional HOLD LUMBAR events for YZM.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YZM	BD	0	0
	JB	0	1
	XBC	0	1
	DBC	0	0
	YL	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YZM	0	0
JB		1	1
XBC		0	0
DBC		0	0
YL		0	0
XK		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total HOLD LUMBAR events for YZM.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
JB	1	2
XBC	0	1
DBC	0	0
YL	0	0
XK	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional BODY GRAB events for YZM.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YZM	BD	0	0
	JB	0	0
	XBC	0	0
	DBC	0	0
	YL	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YZM	0	0
JB		0	0
XBC		0	0
DBC		1	0
YL		2	0
XK		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total BODY GRAB events for YZM.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
JB	0	0
XBC	0	0
DBC	1	0
YL	2	0
XK	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional HEAD BUTTING events for YZM.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YZM	BD	0	0
	JB	0	0
	XBC	0	0
	DBC	0	0
	YL	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YZM	0	0
JB		1	0
XBC		0	0
DBC		0	0
YL		0	0
XK		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total HEAD BUTTING events for YZM.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
JB	1	0
XBC	0	0
DBC	0	0
YL	0	0
XK	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional WRESTLE events for YZM.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YZM	BD	0	0
	JB	0	0
	XBC	0	0
	DBC	1	0
	YL	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YZM	0	0
JB		0	0
XBC		0	0
DBC		0	0
YL		1	0
XK		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total WRESTLE events for YZM.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
JB	0	0
XBC	0	0
DBC	1	0
YL	1	0
XK	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional CHASE events for YZM.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YZM	BD	0	0
	JB	1	0
	XBC	0	0
	DBC	0	0
	YL	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YZM	0	0
JB		0	0
XBC		0	0
DBC		0	0
YL		0	0
XK		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total CHASE events for YZM.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
JB	1	0
XBC	0	0
DBC	0	0
YL	0	0
XK	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional LUNGE events for YZM.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YZM	BD	0	0
	JB	0	0
	XBC	0	0
	DBC	0	0
	YL	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YZM	0	0
JB		0	0
XBC		0	0
DBC		0	0
YL		0	0
XK		0	0
FEMALE		1	0
SUBADULT		0	0
UNKNOWN		0	0

Total LUNGE events for YZM.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
JB	0	0
XBC	0	0
DBC	0	0
YL	0	0
XK	0	0
FEMALE	1	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional ARM SWIPE events for YZM.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YZM	BD	0	0
	JB	0	0
	XBC	0	0
	DBC	0	0
	YL	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YZM	1	0
JB		0	0
XBC		0	0
DBC		0	0
YL		0	0
XK		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total ARM SWIPE events for YZM.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	1	0
JB	0	0
XBC	0	0
DBC	0	0
YL	0	0
XK	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Appendix 2: Breakdown of BBBG2 behavioural events

Self groom: Period before 2006 birth season: 17, **Period after 2006 birth season:** 31

Copulation: Period before 2006 birth season: 3, **Period after 2006 birth season:** 0

Total directional events for DBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
DBC	BD	1	7
	JB	6	1
	XBC	14	15
	XK	8	3
	YZM	9	0
	YL	2	37
	FEMALE	7	2
	SUBADULT	0	0
	UNKNOWN	1	0
BD	DBC	4	7
JB		7	8
XBC		8	11
XK		4	2
YZM		2	4
YL		5	27
FEMALE		4	0
SUBADULT		0	0
UNKNOWN		0	0

Total events for DBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	6	14
JB	14	10
XBC	28	31
XK	16	5
YZM	15	4
YL	10	96
FEMALE	13	2
SUBADULT	0	0
UNKNOWN	1	0

Total directional AGONISITIC events for DBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
DBC	BD	0	1
	JB	0	0
	XBC	1	2
	XK	0	0
	YZM	0	0
	YL	0	1
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	DBC	1	0
JB		0	0
XBC		0	2
XK		1	0
YZM		1	0
YL		1	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total AGONISITIC events for DBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	1	1
JB	0	0
XBC	1	4
XK	1	0
YZM	1	0
YL	1	1
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional OTHER events for DBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
DBC	BD	0	0
	JB	0	0
	XBC	0	0
	XK	0	0
	YZM	2	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	DBC	0	0
JB		0	0
XBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total OTHER events for DBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
JB	0	0
XBC	0	0
XK	0	0
YZM	2	0
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional AFFLIATIVE events for DBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
DBC	BD	1	6
	JB	6	1
	XBC	13	13
	XK	8	3
	YZM	7	0
	YL	2	36
	FEMALE	7	2
	SUBADULT	0	0
	UNKNOWN	1	0
BD	DBC	3	7
JB		8	8
XBC		8	9
XK		3	2
YZM		1	4
YL		4	27
FEMALE		4	0
SUBADULT		0	0
UNKNOWN		0	0

Total AFFILIATIVE events for DBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	5	13
JB	15	10
XBC	27	27
XK	15	5
YZM	12	4
YL	9	95
FEMALE	13	2
SUBADULT	0	0
UNKNOWN	1	0

Total directional PROXIMITY events for DBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
DBC	BD	0	3
	JB	5	0
	XBC	4	8
	XK	1	1
	YZM	7	0
	YL	2	7
	FEMALE	1	2
	SUBADULT	0	0
	UNKNOWN	1	0
BD	DBC	0	3
JB		5	7
XBC		1	7
XK		2	2
YZM		1	3
YL		4	7
FEMALE		3	0
SUBADULT		0	0
UNKNOWN		0	0

Total PROXIMITY events for DBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	6
JB	12	8
XBC	8	20
XK	3	3
YZM	12	3
YL	9	22
FEMALE	5	2
SUBADULT	0	0
UNKNOWN	1	0

Total directional SINGLE GROOM events for DBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
DBC	BD	1	3
	JB	1	1
	XBC	5	4
	XK	4	2
	YZM	0	0
	YL	0	24
	FEMALE	5	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	DBC	3	3
JB		0	0
XBC		2	1
XK		1	0
YZM		0	0
YL		0	9
FEMALE		1	0
SUBADULT		0	0
UNKNOWN		0	0

Total SINGLE GROOM events for DBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	4	6
JB	1	1
XBC	7	5
XK	5	2
YZM	0	0
YL	0	33
FEMALE	6	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional RECIPROCAL GROOM events for DBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
DBC	BD	0	0
	JB	0	0
	XBC	3	0
	XK	1	0
	YZM	0	0
	YL	0	3
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	DBC	0	0
JB		1	0
XBC		4	1
XK		0	0
YZM		0	0
YL		0	5
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total RECIPROCAL GROOM events for DBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
JB	1	0
XBC	7	1
XK	1	0
YZM	0	0
YL	0	8
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional LESSER BODY CONTACT events for DBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
DBC	BD	0	0
	JB	0	0
	XBC	0	0
	XK	1	0
	YZM	0	0
	YL	0	2
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	DBC	0	0
JB		0	1
XBC		0	0
XK		0	0
YZM		0	0
YL		0	1
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total LESSER BODY CONTACT events for DBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
JB	0	1
XBC	0	0
XK	1	0
YZM	0	0
YL	0	12
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional GREATER BODY CONTACT events for DBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
DBC	BD	0	0
	JB	0	0
	XBC	1	1
	XK	1	0
	YZM	0	0
	YL	0	0
	FEMALE	1	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	DBC	0	1
JB		0	0
XBC		0	0
XK		0	0
YZM		0	1
YL		0	4
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total GREATER BODY CONTACT events for DBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	1	1
JB	0	0
XBC	2	1
XK	2	0
YZM	0	1
YL	0	14
FEMALE	2	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional APPROACH(WALK)-RETREAT events for DBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
DBC	BD	0	0
	JB	0	0
	XBC	1	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	DBC	1	0
JB		0	0
XBC		0	2
XK		1	0
YZM		1	0
YL		1	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total APPROACH(WALK)-RETREAT events for DBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	1	0
JB	0	0
XBC	1	2
XK	1	0
YZM	1	0
YL	1	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional EMBRACE events for DBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
DBC	BD	0	0
	JB	0	0
	XBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	DBC	0	0
JB		0	0
XBC		1	0
XK		0	0
YZM		0	0
YL		0	1
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total EMBRACE events for DBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
JB	0	0
XBC	2	0
XK	3	0
YZM	0	0
YL	0	6
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional FUR GRAB events for DBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
DBC	BD	0	0
	JB	0	0
	XBC	0	0
	XK	0	0
	YZM	2	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	DBC	0	0
JB		0	0
XBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total FUR GRAB events for DBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
JB	0	0
XBC	0	0
XK	0	0
YZM	2	0
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional PUSH events for DBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
DBC	BD	0	1
	JB	0	0
	XBC	0	2
	XK	0	0
	YZM	0	0
	YL	0	1
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	DBC	0	0
JB		0	0
XBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total PUSH events for DBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	1
JB	0	0
XBC	0	2
XK	0	0
YZM	0	0
YL	0	1
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional HOLD LUMBAR events for DBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
DBC	BD	0	0
	JB	0	0
	XBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	DBC	0	0
JB		1	0
XBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total HOLD LUMBAR events for DBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
JB	1	0
XBC	0	0
XK	0	0
YZM	0	0
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Appendix 2: Breakdown of JB behavioural events

Self groom: Period before 2006 birth season: 2, **Period after 2006 birth season:** 5

Total directional events for JB.

Initiator	**Recipient**	**Events scored**	
		BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
JB	BD	9	3
	XBC	10	5
	DBC	11	13
	XK	0	3
	YZM	5	12
	YL	3	1
	FEMALE	1	1
	SUBADULT	0	0
	UNKNOWN	0	0
BD	JB	6	7
XBC		1	5
DBC		9	14
XK		0	6
YZM		2	5
YL		3	1
FEMALE		1	0
SUBADULT		0	0
UNKNOWN		0	0

Total events for JB.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	17	17
XBC	13	10
DBC	23	31
XK	0	10
YZM	8	20
YL	8	2
FEMALE	4	1
SUBADULT	0	0
UNKNOWN	0	0

Total directional AFFILIATIVE events for JB.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
JB	BD	9	3
	XBC	9	4
	DBC	8	11
	XK	0	3
	YZM	5	12
	YL	2	1
	FEMALE	0	1
	SUBADULT	0	0
	UNKNOWN	0	0
BD	JB	5	7
XBC		1	5
DBC		9	14
XK		0	6
YZM		2	5
YL		3	1
FEMALE		2	0
SUBADULT		0	0
UNKNOWN		0	0

Total AFFILIATIVE events for JB.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	16	17
XBC	12	9
DBC	22	29
XK	0	10
YZM	8	20
YL	7	2
FEMALE	3	1
SUBADULT	0	0
UNKNOWN	0	0

Total directional AGONISITIC events for JB.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
JB	BD	0	0
	XBC	1	1
	DBC	1	2
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	1	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	JB	1	0
XBC		0	0
DBC		0	0
XK		0	0
YZM		0	0
YL		1	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total AGONISITIC events for JB.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	1	0
XBC	1	1
DBC	1	2
XK	0	0
YZM	0	0
YL	1	0
FEMALE	1	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional OTHER events for JB.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
JB	BD	0	0
	XBC	0	0
	DBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	JB	0	0
XBC		0	0
DBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total OTHER events for JB.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
XBC	0	0
DBC	0	0
XK	0	0
YZM	0	0
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional PROXIMITY events for JB.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
JB	BD	2	0
	XBC	9	2
	DBC	4	6
	XK	0	2
	YZM	4	12
	YL	1	1
	FEMALE	0	1
	SUBADULT	0	0
	UNKNOWN	0	0
BD	JB	0	0
XBC		1	2
DBC		0	4
XK		0	0
YZM		1	3
YL		1	1
FEMALE		2	0
SUBADULT		0	0
UNKNOWN		0	0

Total PROXIMITY events for JB.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	2	0
XBC	12	4
DBC	6	13
XK	0	2
YZM	6	17
YL	4	2
FEMALE	3	1
SUBADULT	0	0
UNKNOWN	0	0

Total directional GREATER BODY CONTACT events for JB.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
JB	BD	0	0
	XBC	0	0
	DBC	1	1
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	JB	0	0
XBC		0	0
DBC		1	1
XK		0	2
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total GREATER BODY CONTACT events for JB.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
XBC	0	0
DBC	4	4
XK	0	3
YZM	0	0
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional LESSER BODY CONTACT events for JB.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
JB	BD	0	0
	XBC	0	1
	DBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	JB	0	0
XBC		0	0
DBC		0	0
XK		0	1
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total LESSER BODY CONTACT events for JB.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
XBC	0	1
DBC	0	1
XK	0	1
YZM	0	1
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional EMBRACE events for JB.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
JB	BD	1	2
	XBC	0	0
	DBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	JB	0	0
XBC		0	1
DBC		1	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total EMBRACE events for JB.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	3	9
XBC	0	1
DBC	2	0
XK	0	0
YZM	0	0
YL	2	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional HOLD LUMBAR events for JB.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
JB	BD	2	0
	XBC	0	0
	DBC	0	1
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	JB	0	0
XBC		0	0
DBC		2	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total HOLD LUMBAR events for JB.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	2	0
XBC	0	0
DBC	2	1
XK	0	0
YZM	0	0
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional SINGLE GROOM events for JB.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
JB	BD	2	1
	XBC	0	0
	DBC	3	1
	XK	0	1
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	JB	4	6
XBC		0	2
DBC		5	7
XK		0	3
YZM		1	2
YL		1	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total SINGLE GROOM events for JB.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	6	7
XBC	0	2
DBC	8	8
XK	0	4
YZM	1	2
YL	1	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional RECIPROCAL GROOM events for JB.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
JB	BD	2	0
	XBC	0	1
	DBC	0	2
	XK	0	0
	YZM	1	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	JB	1	1
XBC		0	0
DBC		0	2
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total RECIPROCAL GROOM events for JB.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	3	1
XBC	0	1
DBC	0	2
XK	0	0
YZM	1	0
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional APPROACH(WALK)-RETREAT events for JB.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
JB	BD	0	0
	XBC	0	1
	DBC	1	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	JB	0	0
XBC		0	0
DBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total APPROACH(WALK)-RETREAT events for JB.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
XBC	0	1
DBC	1	0
XK	0	0
YZM	0	0
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional COPULATION events for JB.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
JB	BD	1	0
	XBC	3	0
	DBC	2	2
	XK	0	0
	YZM	0	2
	YL	1	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	JB	0	0
XBC		0	0
DBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total COPULATION events for JB.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	1	0
XBC	3	0
DBC	2	2
XK	0	0
YZM	0	2
YL	1	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional LUNGE events for JB.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
JB	BD	0	0
	XBC	0	0
	DBC	0	1
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	JB	0	0
XBC		0	0
DBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total LUNGE events for JB.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
XBC	0	0
DBC	0	1
XK	0	0
YZM	0	0
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional ARM SWIPE events for JB.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
JB	BD	0	0
	XBC	0	0
	DBC	0	1
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	JB	0	0
XBC		0	0
DBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total ARM SWIPE events for JB.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
XBC	0	0
DBC	0	1
XK	0	0
YZM	0	0
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional CHASE events for JB.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
JB	BD	0	0
	XBC	1	0
	DBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	1	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	JB	1	0
XBC		0	0
DBC		0	0
XK		0	0
YZM		0	0
YL		1	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total CHASE events for JB.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	1	0
XBC	1	0
DBC	0	0
XK	0	0
YZM	0	0
YL	1	0
FEMALE	1	0
SUBADULT	0	0
UNKNOWN	0	0

Appendix 2: Breakdown of XBC behavioural events

Self groom: Period before 2006 birth season: 4, **Period after 2006 birth season:** 16

Copulation: Period before 2006 birth season: 3, **Period after 2006 birth season:** 0

Total directional events for XBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
XBC	BD	0	0
	JB	5	1
	DBC	1	8
	XK	2	8
	YZM	1	7
	YL	1	1
	FEMALE	7	0
	SUBADULT	1	0
	UNKNOWN	0	0
BD	XBC	0	1
JB		3	2
DBC		1	7
XK		0	18
YZM		1	8
YL		0	0
FEMALE		7	0
SUBADULT		0	0
UNKNOWN		0	0

Total events for XBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	1
JB	9	3
DBC	2	17
XK	2	32
YZM	2	18
YL	1	1
FEMALE	22	0
SUBADULT	1	0
UNKNOWN	0	0

Total directional AFFILATIVE events for XBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
XBC	BD	0	0
	JB	5	1
	DBC	1	7
	XK	2	8
	YZM	1	7
	YL	1	1
	FEMALE	7	0
	SUBADULT	1	0
	UNKNOWN	0	0
BD	XBC	0	1
JB		2	1
DBC		1	7
XK		0	18
YZM		1	8
YL		0	0
FEMALE		7	0
SUBADULT		0	0
UNKNOWN		0	0

Total AFFILATIVE events for XBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	1
JB	8	2
DBC	2	16
XK	2	32
YZM	2	18
YL	1	1
FEMALE	22	0
SUBADULT	1	0
UNKNOWN	0	0

Total directional AGONISITIC events for XBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
XBC	BD	0	0
	JB	0	0
	DBC	0	1
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	XBC	0	0
JB		1	1
DBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total AGONISITIC events for XBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
JB	1	1
DBC	0	1
XK	0	0
YZM	0	0
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional EMBRACE events for XBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
XBC	BD	0	0
	JB	0	0
	DBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	XBC	0	0
JB		0	0
DBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total EMBRACE events for XBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
JB	0	0
DBC	0	0
XK	0	0
YZM	0	0
YL	0	0
FEMALE	3	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional SINGLE GROOM events for XBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
XBC	BD	0	0
	JB	0	1
	DBC	0	0
	XK	0	5
	YZM	0	3
	YL	0	0
	FEMALE	1	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	XBC	0	0
JB		0	0
DBC		0	0
XK		0	8
YZM		0	4
YL		0	0
FEMALE		4	0
SUBADULT		0	0
UNKNOWN		0	0

Total SINGLE GROOM events for XBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
JB	0	1
DBC	0	0
XK	0	13
YZM	0	7
YL	0	0
FEMALE	5	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional RECIPROCAL GROOM events for XBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
XBC	BD	0	0
	JB	0	0
	DBC	0	0
	XK	0	1
	YZM	0	1
	YL	0	0
	FEMALE	5	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	XBC	0	0
JB		0	0
DBC		0	0
XK		0	1
YZM		0	0
YL		0	0
FEMALE		2	0
SUBADULT		0	0
UNKNOWN		0	0

Total RECIPROCAL GROOM events for XBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
JB	0	0
DBC	0	0
XK	0	2
YZM	0	1
YL	0	0
FEMALE	7	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional PROXIMITY events for XBC.

Initiator	Recipient	Events scored: BEFORE BIRTH SEASON	Events scored: AFTER BIRTH SEASON
XBC	BD	0	0
	JB	4	0
	DBC	1	4
	XK	2	2
	YZM	1	2
	YL	1	1
	FEMALE	1	0
	SUBADULT	1	0
	UNKNOWN	0	0
BD	XBC	0	1
JB		2	1
DBC		1	6
XK		0	6
YZM		1	3
YL		0	0
FEMALE		1	0
SUBADULT		0	0
UNKNOWN		0	0

Total PROXIMITY events for XBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	1
JB	7	1
DBC	2	12
XK	2	12
YZM	2	7
YL	1	1
FEMALE	3	0
SUBADULT	1	0
UNKNOWN	0	0

Total directional GREATER BODY CONTACT events for XBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
XBC	BD	0	0
	JB	1	0
	DBC	0	3
	XK	0	0
	YZM	0	1
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	XBC	0	0
JB		0	0
DBC		0	0
XK		0	2
YZM		0	1
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total GREATER BODY CONTACT events for XBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
JB	1	0
DBC	0	3
XK	0	4
YZM	0	2
YL	0	0
FEMALE	3	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional LESSER BODY CONTACT events for XBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
XBC	BD	0	0
	JB	0	0
	DBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	XBC	0	0
JB		0	0
DBC		0	1
XK		0	1
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total LESSER BODY CONTACT events for XBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
JB	0	0
DBC	0	1
XK	0	1
YZM	0	1
YL	0	0
FEMALE	1	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional APPROACH(WALK)-RETREAT events for XBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
XBC	BD	0	0
	JB	0	0
	DBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	XBC	0	0
JB		1	1
DBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total APPRAOCH(WALK)-RETREAT events for XBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
JB	1	1
DBC	0	0
XK	0	0
YZM	0	0
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional BODY PUSH events for XBC.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
XBC	BD	0	0
	JB	0	0
	DBC	0	1
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	XBC	0	0
JB		0	0
DBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total BODY PUSH events for XBC.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
JB	0	0
DBC	0	1
XK	0	0
YZM	0	0
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Appendix 2: Breakdown of XK behavioural events

Self groom: Period before 2006 birth season: 8, **Period after 2006 birth season:** 31

Copulation: Period before 2006 birth season: 0, **Period after 2006 birth season:** 1

Total directional events for XK.

Initiator	Recipient	Events scored: BEFORE BIRTH SEASON	Events scored: AFTER BIRTH SEASON
XK	BD	2	2
	JB	8	1
	XBC	4	5
	DBC	2	1
	YZM	10	2
	YL	0	12
	FEMALE	1	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	DBC	0	0
JB		1	0
XBC		2	3
XK		1	2
YZM		7	2
YL		0	6
FEMALE		0	0
SUBADULT		3	0
UNKNOWN		0	0

Total events for XK.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	2	3
JB	10	2
XBC	8	9
DBC	3	3
YZM	22	5
YL	1	29
FEMALE	1	0
SUBADULT	3	0
UNKNOWN	0	0

Total directional AFFILIATIVE events for XK.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
XK	BD	2	2
	JB	8	1
	XBC	4	5
	DBC	2	1
	YZM	10	2
	YL	0	12
	FEMALE	1	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	DBC	0	0
JB		1	0
XBC		2	3
XK		1	2
YZM		7	2
YL		0	6
FEMALE		0	0
SUBADULT		3	0
UNKNOWN		0	0

Total AFFILIATIVE events for XK.

Partner	**Events scored**	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	2	3
JB	10	2
XBC	8	9
DBC	3	3
YZM	22	5
YL	1	29
FEMALE	1	0
SUBADULT	3	0
UNKNOWN	0	0

0 **AGONISTIC EVENTS**

0 **OTHER EVENTS**

Total directional EMBRACE events for XK.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
XK	BD	1	0
	JB	0	0
	XBC	1	0
	DBC	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	XK	0	0
JB		0	0
XBC		0	0
DBC		0	0
YZM		0	0
YL		0	1
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total EMBRACE events for XK.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	1	1
JB	0	0
XBC	3	0
DBC	0	0
YZM	0	0
YL	0	1
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional SINGLE GROOM events for XK.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
XK	BD	0	1
	JB	0	0
	XBC	1	1
	DBC	0	0
	YZM	2	2
	YL	0	10
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	DBC	0	0
JB		1	0
XBC		1	1
DBC		0	1
YZM		3	2
YL		0	1
FEMALE		0	0
SUBADULT		1	0
UNKNOWN		0	0

Total SINGLE GROOM events for XK.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	1
JB	1	0
XBC	2	2
DBC	0	1
YZM	5	4
YL	0	11
FEMALE	0	0
SUBADULT	1	0
UNKNOWN	0	0

Total directional RECIPROCAL GROOM events for XK.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
XK	BD	0	0
	JB	0	0
	XBC	1	0
	DBC	0	1
	YZM	0	0
	YL	0	1
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	XK	0	0
JB		0	0
XBC		1	1
DBC		0	1
YZM		0	0
YL		0	2
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total RECIPROCAL GROOM events for XK.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
JB	0	0
XBC	2	1
DBC	0	2
YZM	0	0
YL	0	3
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional PROXIMITY events for XK.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
XK	BD	1	1
	JB	8	1
	XBC	1	4
	DBC	2	0
	YZM	7	0
	YL	0	1
	FEMALE	1	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	XK	0	0
JB		0	0
XBC		0	1
DBC		1	0
YZM		2	0
YL		0	2
FEMALE		0	0
SUBADULT		2	0
UNKNOWN		0	0

Total PROXIMITY events for XK.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	1	1
JB	9	2
XBC	1	5
DBC	3	0
YZM	11	0
YL	1	4
FEMALE	1	0
SUBADULT	2	0
UNKNOWN	0	0

Total directional GREATER BODY CONTACT events for XK.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
XK	BD	0	0
	JB	0	0
	XBC	0	0
	DBC	0	0
	YZM	1	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	DBC	0	0
JB		0	0
XBC		0	0
DBC		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total GREATER BODY CONTACT events for XK.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
JB	0	0
XBC	0	0
DBC	0	0
YZM	4	0
YL	0	8
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional LESSER BODY CONTACT events for XK.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
XK	BD	0	0
	JB	0	0
	XBC	0	0
	DBC	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	DBC	0	0
JB		0	0
XBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total LESSER BODY CONTACT events for XK.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
JB	0	0
XBC	0	1
DBC	0	0
YZM	0	1
YL	0	2
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional HOLD LUMBAR events for XK.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
XK	BD	0	0
	JB	0	0
	XBC	0	0
	DBC	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	DBC	0	0
JB		0	0
XBC		0	0
XK		0	0
YZM		2	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total HOLD LUMBAR events for XK.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
JB	0	0
XBC	0	0
DBC	0	0
YZM	2	0
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Appendix 2: Breakdown of YL behavioural events

Self groom: Period before 2006 birth season: 40, **Period after 2006 birth season:** 36
Copulation: Period before 2006 birth season: 1, **Period after 2006 birth season:** 0
Pseudocopulation: Period before 2006 birth season: YL-YZM: 1, **Period after 2006 birth season:** 0

Total directional events for YL.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
YL	BD	3	2
	JB	10	1
	XBC	3	5
	DBC	12	20
	YZM	3	5
	XK	1	3
	FEMALE	11	0
	SUBADULT	4	0
	UNKNOWN	0	0
BD	YL	0	6
JB		4	5
XBC		1	9
DBC		9	30
YZM		1	5
XK		0	4
FEMALE		12	1
SUBADULT		5	0
UNKNOWN		0	0

Total events for YL.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	4	10
JB	17	8
XBC	4	18
DBC	26	70
YZM	5	14
XK	2	9
FEMALE	27	1
SUBADULT	14	0
UNKNOWN	0	0

Total directional AFFILATIVE events for YL.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YL	BD	3	1
	JB	10	1
	XBC	1	5
	DBC	11	20
	YZM	3	5
	XK	1	3
	FEMALE	11	0
	SUBADULT	2	0
	UNKNOWN	0	0
BD	YL	0	6
JB		3	5
XBC		1	9
DBC		9	29
YZM		1	5
XK		0	4
FEMALE		12	1
SUBADULT		5	0
UNKNOWN		0	0

Total AFFILATIVE events for YL.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	4	9
JB	16	8
XBC	2	18
DBC	25	69
YZM	5	14
XK	2	9
FEMALE	27	1
SUBADULT	12	0
UNKNOWN	0	0

Total directional AGONISITIC events for YL.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YL	BD	0	1
	JB	0	0
	XBC	2	0
	DBC	0	0
	YZM	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	2	0
	UNKNOWN	0	0
BD	YL	0	0
JB		1	0
XBC		0	0
DBC		0	1
YZM		0	0
XK		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total AGONISITIC events for YL.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	1
JB	1	0
XBC	2	0
DBC	0	1
YZM	0	0
XK	0	0
FEMALE	0	0
SUBADULT	2	0
UNKNOWN	0	0

Total directional OTHER events for YL.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YL	BD	0	0
	JB	0	0
	XBC	0	0
	DBC	1	0
	YZM	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YL	0	0
JB		0	0
XBC		0	0
DBC		0	0
YZM		0	0
XK		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total OTHER events for YL.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
JB	0	0
XBC	0	0
DBC	1	0
YZM	0	0
XK	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional SINGLE GROOM events for YL.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YL	BD	1	0
	JB	2	1
	XBC	0	1
	DBC	2	8
	YZM	0	2
	XK	0	2
	FEMALE	5	0
	SUBADULT	1	0
	UNKNOWN	0	0
BD	YL	0	4
JB		0	0
XBC		0	4
DBC		4	16
YZM		1	4
XK		0	2
FEMALE		5	0
SUBADULT		0	0
UNKNOWN		0	0

Total SINGLE GROOM events for YL.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	1	4
JB	2	1
XBC	0	5
DBC	6	24
YZM	1	6
XK	0	4
FEMALE	10	0
SUBADULT	1	0
UNKNOWN	0	0

Total directional RECIPROCAL GROOM events for YL.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YL	BD	0	0
	JB	0	0
	XBC	0	2
	DBC	1	2
	YZM	0	0
	XK	0	0
	FEMALE	3	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YL	0	0
JB		0	0
XBC		0	2
DBC		2	2
YZM		0	0
XK		0	1
FEMALE		3	0
SUBADULT		0	0
UNKNOWN		0	0

Total RECIPROCAL GROOM events for YL.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
JB	0	0
XBC	0	4
DBC	3	4
YZM	0	0
XK	0	1
FEMALE	6	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional PROXIMITY events for YL.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YL	BD	0	1
	JB	8	0
	XBC	1	2
	DBC	8	6
	YZM	1	3
	XK	1	1
	FEMALE	2	0
	SUBADULT	1	0
	UNKNOWN	0	0
BD	YL	0	2
JB		3	4
XBC		1	2
DBC		2	7
YZM		0	0
XK		0	0
FEMALE		3	1
SUBADULT		5	0
UNKNOWN		0	0

Total PROXIMITY events for YL.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	3
JB	13	5
XBC	2	6
DBC	10	21
YZM	1	6
XK	2	2
FEMALE	5	1
SUBADULT	6	0
UNKNOWN	0	0

Total directional LESSER BODY CONTACT events for YL.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YL	BD	1	0
	JB	0	0
	XBC	0	0
	DBC	0	4
	YZM	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YL	0	0
JB		0	0
XBC		0	0
DBC		0	1
YZM		0	1
XK		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total LESSER BODY CONTACT events for YL.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	1	0
JB	1	1
XBC	0	0
DBC	2	7
YZM	1	1
XK	0	0
FEMALE	2	0
SUBADULT	1	0
UNKNOWN	0	0

Total directional GREATER BODY CONTACT events for YL.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YL	BD	0	0
	JB	0	0
	XBC	0	0
	DBC	0	0
	YZM	2	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YL	0	0
JB		0	1
XBC		0	1
DBC		1	3
YZM		0	0
XK		0	0
FEMALE		1	0
SUBADULT		0	0
UNKNOWN		0	0

Total GREATER BODY CONTACT events for YL.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	1	2
JB	0	1
XBC	0	3
DBC	2	11
YZM	2	0
XK	0	1
FEMALE	3	0
SUBADULT	1	0
UNKNOWN	0	0

Total directional BODY CONTACT UNKNOWN AMOUNT. events for YL.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YL	BD	0	0
	JB	0	0
	XBC	0	0
	DBC	0	0
	YZM	0	0
	XK	0	0
	FEMALE	1	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YL	0	0
JB		0	0
XBC		0	0
DBC		0	0
YZM		0	0
XK		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total BODY CONTACT UNKNOWN AMOUNT events for YL.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
JB	0	0
XBC	0	0
DBC	0	1
YZM	0	1
XK	0	0
FEMALE	1	0
SUBADULT	2	0
UNKNOWN	0	0

Total directional EMBRACE events for YL.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YL	BD	0	0
	JB	0	0
	XBC	0	0
	DBC	0	0
	YZM	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YL	0	0
JB		0	0
XBC		0	0
DBC		0	0
YZM		0	0
XK		0	1
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total EMBRACE events for YL.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
JB	0	0
XBC	0	0
DBC	2	1
YZM	0	0
XK	0	1
FEMALE	0	0
SUBADULT	1	0
UNKNOWN	0	0

Total directional APPROACH(WALK)-RETREAT events for YL.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YL	BD	0	1
	JB	0	0
	XBC	1	0
	DBC	0	0
	YZM	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YL	0	0
JB		1	0
XBC		0	0
DBC		0	1
YZM		0	0
XK		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total APPROACH(WALK)-RETREAT events for YL.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	1
JB	1	0
XBC	1	0
DBC	0	1
YZM	0	0
XK	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional ARM SWIPE events for YL.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YL	BD	0	0
	JB	0	0
	XBC	0	0
	DBC	0	0
	YZM	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	1	0
	UNKNOWN	0	0
BD	YL	0	0
JB		0	0
XBC		0	0
DBC		0	0
YZM		0	0
XK		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total ARM SWIPE events for YL.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
JB	0	0
XBC	0	0
DBC	0	0
YZM	0	0
XK	0	0
FEMALE	0	0
SUBADULT	1	0
UNKNOWN	0	0

Total directional LUNGE events for YL.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YL	BD	0	0
	JB	0	0
	XBC	1	0
	DBC	0	0
	YZM	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	1	0
	UNKNOWN	0	0
BD	YL	0	0
JB		0	0
XBC		0	0
DBC		0	0
YZM		0	0
XK		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total LUNGE events for YL.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	0	0
JB	0	0
XBC	1	0
DBC	0	0
YZM	0	0
XK	0	0
FEMALE	0	0
SUBADULT	1	0
UNKNOWN	0	0

Total directional HOLD LUMBAR events for YL.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YL	BD	1	0
	JB	0	0
	XBC	0	0
	DBC	0	0
	YZM	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YL	0	0
JB		0	0
XBC		0	0
DBC		0	0
YZM		0	0
XK		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total HOLD LUMBAR events for YL.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	1	0
JB	0	0
XBC	0	0
DBC	0	0
YZM	0	0
XK	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional FUR GRAB events for YL.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
YL	BD	0	0
	JB	0	0
	XBC	0	0
	DBC	1	0
	YZM	0	0
	XK	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
BD	YL	0	0
JB		0	0
XBC		0	0
DBC		0	0
YZM		0	0
XK		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total FUR GRAB events for YL.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	0	0
JB	0	0
XBC	0	0
DBC	1	0
YZM	0	0
XK	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Appendix 2: Breakdown of BD behavioural events

Self groom: Period before 2006 birth season: 18, **Period after 2006 birth season:** 40

Copulation: Period before 2006 birth season: 2, **Period after 2006 birth season:** 0

Total directional events for BD.

Initiator	**Recipient**	**Events scored**	
		BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
BD	JB	13	16
	XBC	3	17
	DBC	1	0
	XK	0	0
	YZM	5	5
	YL	0	2
	FEMALE	2	0
	SUBADULT	3	1
	UNKNOWN	0	0
JB	BD	17	21
XBC		10	10
DBC		3	3
XK		0	1
YZM		3	6
YL		1	3
FEMALE		0	0
SUBADULT		1	1
UNKNOWN		0	0

Total events for BD.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
JB	39	44
XBC	17	35
DBC	5	5
XK	0	2
YZM	12	17
YL	2	8
FEMALE	3	0
SUBADULT	4	3
UNKNOWN	0	0

Total directional AFFILATIVE events for BD.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	JB	13	16
	XBC	3	17
	DBC	1	0
	XK	0	0
	YZM	5	5
	YL	0	2
	FEMALE	2	0
	SUBADULT	2	1
	UNKNOWN	0	0
JB	BD	15	19
XBC		10	10
DBC		3	3
XK		0	1
YZM		3	4
YL		1	3
FEMALE		0	0
SUBADULT		1	1
UNKNOWN		0	0

Total AFFILATIVE events for BD.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
JB	37	42
XBC	17	35
DBC	5	5
XK	0	2
YZM	12	15
YL	2	8
FEMALE	3	0
SUBADULT	3	3
UNKNOWN	0	0

Total directional AGONISITIC events for BD.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	JB	0	0
	XBC	0	0
	DBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	1	0
	UNKNOWN	0	0
JB	BD	1	0
XBC		0	0
DBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total AGONISITIC events for BD.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
JB	1	0
XBC	0	0
DBC	0	0
XK	0	0
YZM	0	0
YL	0	0
FEMALE	0	0
SUBADULT	1	0
UNKNOWN	0	0

Total directional OTHER events for BD.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	JB	0	0
	XBC	0	0
	DBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
JB	BD	1	2
XBC		0	0
DBC		0	0
XK		0	0
YZM		0	2
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total OTHER events for BD.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
JB	1	2
XBC	0	0
DBC	0	0
XK	0	0
YZM	0	2
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional EMBRACE events for BD.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	JB	3	0
	XBC	1	0
	DBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	UNKNOWN	0	0
	UNKNOWN	0	0
JB	BD	2	0
XBC		0	0
DBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total EMBRACE events for BD.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
JB	9	0
XBC	2	0
DBC	0	0
XK	0	0
YZM	1	1
YL	1	0
FEMALE	0	0
SUBADULT	0	1
UNKNOWN	0	0

Total directional SINGLE GROOM events for BD.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	JB	10	11
	XBC	2	8
	DBC	1	0
	XK	0	0
	YZM	5	3
	YL	0	1
	FEMALE	2	0
	SUBADULT	0	0
	UNKNOWN	0	0
JB	BD	2	5
XBC		3	1
DBC		0	0
XK		0	1
YZM		0	1
YL		0	0
FEMALE		0	0
SUBADULT		0	1
UNKNOWN		0	0

Total SINGLE GROOM events for BD.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
JB	12	16
XBC	5	9
DBC	1	0
XK	0	1
YZM	5	4
YL	0	1
FEMALE	2	0
SUBADULT	0	1
UNKNOWN	0	0

Total directional RECIPROCAL GROOM events for BD.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	JB	0	4
	XBC	0	0
	DBC	0	0
	XK	0	0
	YZM	0	1
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	1
	UNKNOWN	0	0
JB	BD	0	2
XBC		0	1
DBC		0	0
XK		0	0
YZM		2	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total RECIPROCAL GROOM events for BD.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
JB	0	6
XBC	0	1
DBC	0	0
XK	0	0
YZM	2	1
YL	0	0
FEMALE	0	0
SUBADULT	0	1
UNKNOWN	0	0

Total directional PROXIMITY events for BD.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	JB	0	1
	XBC	0	7
	DBC	0	0
	XK	0	0
	YZM	0	1
	YL	0	1
	FEMALE	0	0
	SUBADULT	1	0
	UNKNOWN	0	0
JB	BD	7	8
XBC		4	6
DBC		3	3
XK		0	0
YZM		1	3
YL		1	3
FEMALE		0	0
SUBADULT		1	0
UNKNOWN		0	0

Total PROXIMITY events for BD.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
JB	11	12
XBC	5	19
DBC	4	5
XK	0	1
YZM	3	6
YL	1	7
FEMALE	1	0
SUBADULT	2	0
UNKNOWN	0	0

Total directional LESSER BODY CONTACT events for BD.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	JB	0	0
	XBC	0	1
	DBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	1	0
	UNKNOWN	0	0
JB	BD	0	1
XBC		0	1
DBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total LESSER BODY CONTACT events for BD.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
JB	0	5
XBC	2	3
DBC	0	0
XK	0	0
YZM	1	2
YL	0	0
FEMALE	0	0
SUBADULT	1	0
UNKNOWN	0	0

Total directional GREATER BODY CONTACT events for BD.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	JB	0	0
	XBC	0	1
	DBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
JB	BD	1	2
XBC		2	1
DBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total GREATER BODY CONTACT events for BD.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
JB	2	2
XBC	2	3
DBC	0	0
XK	0	0
YZM	0	0
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional BODY CONTACT UNKNOWN AMOUNT events for BD.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	JB	0	0
	XBC	0	0
	DBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
JB	BD	0	1
XBC		0	0
DBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total BODY CONTACT UNKNOWN AMOUNT events for BD.

Partner	**Events scored**	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
JB	0	1
XBC	0	0
DBC	0	0
XK	0	0
YZM	0	1
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional HOLD LUMBAR events for BD.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	JB	0	0
	XBC	0	0
	DBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
JB	BD	3	0
XBC		1	0
DBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total HOLD LUMBAR events for BD.

Partner	**Events scored**	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
JB	3	0
XBC	1	0
DBC	0	0
XK	0	0
YZM	0	0
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional HEAD BUTTING events for BD.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	JB	0	0
	XBC	0	0
	DBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
JB	BD	1	2
XBC		0	0
DBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total HEAD BUTTING events for BD.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
JB	1	2
XBC	0	0
DBC	0	0
XK	0	0
YZM	0	0
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional HEAD PULLING events for BD.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	JB	0	0
	XBC	0	0
	DBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
JB	BD	0	0
XBC		0	0
DBC		0	0
XK		0	0
YZM		0	2
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total HEAD PULLING events for BD.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
JB	0	0
XBC	0	0
DBC	0	0
XK	0	0
YZM	0	2
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Total directional ARM SWIPE events for BD.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	JB	0	0
	XBC	0	0
	DBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	1	0
	UNKNOWN	0	0
JB	BD	0	0
XBC		0	0
DBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total ARM SWIPE events for BD.

Partner	Events scored	
	BEFORE BIRTH SEASON	AFTER BIRTH SEASON
JB	0	0
XBC	0	0
DBC	0	0
XK	0	0
YZM	0	0
YL	0	0
FEMALE	0	0
SUBADULT	1	0
UNKNOWN	0	0

Total directional APPROACH(RUN)-RETREAT events for BD.

Initiator	Recipient	Events scored	
		BEFORE BIRTH SEASON	AFTER BIRTH SEASON
BD	JB	0	0
	XBC	0	0
	DBC	0	0
	XK	0	0
	YZM	0	0
	YL	0	0
	FEMALE	0	0
	SUBADULT	0	0
	UNKNOWN	0	0
JB	BD	1	0
XBC		0	0
DBC		0	0
XK		0	0
YZM		0	0
YL		0	0
FEMALE		0	0
SUBADULT		0	0
UNKNOWN		0	0

Total APPROACH(RUN)-RETREAT events for BD.

Partner	Events scored	
	BEFORE BIRTH SEASON	**AFTER BIRTH SEASON**
JB	1	0
XBC	0	0
DBC	0	0
XK	0	0
YZM	0	0
YL	0	0
FEMALE	0	0
SUBADULT	0	0
UNKNOWN	0	0

Appendix 2: Breakdown of Unidentified Subadult behavioural events

Total directional events for SUBADULT.

Initiator	Recipient	Events scored
SUBADULT	SA	7
	SA(immature)	0
	F	86
	F(immature)	36
	Male	16
	UNKNOWN	0
SA	SUBADULT	23
SA(immature)		4
F		54
F(immature)		14
Male		7
UNKNOWN		0

Total events for SUBADULT

Partner	Events scored
SA	14
SA(immature)	0
F	185
F(immature)	76
Male	46
UNKNOWN	0

Total directional AFFILIATIVE events for SUBADULT.

Initiator	Recipient	Events scored
SUBADULT	SA	6
	SA(immature)	0
	F	86
	F(immature)	36
	Male	15
	UNKNOWN	0
SA	SUBADULT	4
SA(immature)		0
F		52
F(immature)		14
Male		18
UNKNOWN		0

Total AFFILIATIVE events for SUBADULT.

Partner	Events scored
SA	13
SA(immature)	0
F	183
F(immature)	76
Male	40
UNKNOWN	0

Total directional AGONISTIC events for SUBADULT.

Initiator	Recipient	Events scored
SUBADULT	SA	1
	SA(immature)	0
	F	0
	F(immature)	0
	Male	1
	UNKNOWN	0
SA	SUBADULT	0
SA(immature)		0
F		7
F(immature)		0
Male		5
UNKNOWN		0

Total AGONISTIC events for SUBADULT.

Partner	Events scored
SA	1
SA(immature)	0
F	7
F(immature)	0
Male	6
UNKNOWN	0

Total directional APPROACH(WALK)-RETREAT events for SUBADULT.

Initiator	Recipient	Events scored
SUBADULT	SA	0
	SA(immature)	0
	F	0
	F(immature)	0
	Male	0
	UNKNOWN	0
SA	SUBADULT	0
SA(immature)		0
F		5
F(immature)		0
Male		0
UNKNOWN		0

Total APPROACH(WALK)-RETREAT events for SUBADULT

Partner	Events scored
SA	0
SA(immature)	0
F	5
F(immature)	0
Male	0
UNKNOWN	0

Total directional LUNGE events for SUBADULT.

Initiator	Recipient	Events scored
SUBADULT	SA	1
	SA(immature)	0
	F	0
	F(immature)	0
	Male	1
	UNKNOWN	0
SA	SUBADULT	0
SA(immature)		0
F		2
F(immature)		0
Male		5
UNKNOWN		0

Total LUNGE events for SUBADULT.

Partner	Events scored
SA	1
SA(immature)	0
F	2
F(immature)	0
Male	6
UNKNOWN	0

Total directional LESSER BODY CONTACT events for SUBADULT.

Initiator	Recipient	Events scored
SUBADULT	SA	0
	SA(immature)	0
	F	4
	F(immature)	2
	Male	2
	UNKNOWN	0
SA	SUBADULT	1
SA(immature)		0
F		0
F(immature)		0
Male		0
UNKNOWN		0

Total LESSER BODY CONTACT events for SUBADULT.

Partner	Events scored
SA	3
SA(immature)	0
F	11
F(immature)	8
Male	2
UNKNOWN	0

Total directional PROXIMITY events for SUBADULT.

Initiator	Recipient	Events scored
SUBADULT	SA	4
	SA(immature)	0
	F	25
	F(immature)	4
	Male	2
	UNKNOWN	0
SA	SUBADULT	3
SA(immature)		0
F		23
F(immature)		0
Male		15
UNKNOWN		0

Total PROXIMITY events for SUBADULT.

Partner	Events scored
SA	8
SA(immature)	0
F	73
F(immature)	15
Male	20
UNKNOWN	0

Total directional SINGLE GROOM events for SUBADULT.

Initiator	Recipient	Events scored
SUBADULT	SA	2
	SA(immature)	0
	F	44
	F(immature)	23
	Male	8
	UNKNOWN	0
SA	SUBADULT	0
SA(immature)		0
F		13
F(immature)		9
Male		2
UNKNOWN		0

Total SINGLE GROOM events for SUBADULT.

Partner	Events scored
SA	2
SA(immature)	0
F	57
F(immature)	32
Male	10
UNKNOWN	0

Total directional RECIPROCAL GROOM events for SUBADULT.

Initiator	Recipient	Events scored
SUBADULT	SA	0
	SA(immature)	0
	F	9
	F(immature)	3
	Male	0
	UNKNOWN	0
SA	SUBADULT	0
SA(immature)		0
F		14
F(immature)		2
Male		0
UNKNOWN		0

Total RECIPROCAL GROOM events for SUBADULT.

Partner	Events scored
SA	0
SA(immature)	0
F	23
F(immature)	5
Male	0
UNKNOWN	0

Total directional HOLD LUMBAR events for SUBADULT.

Initiator	Recipient	Events scored
SUBADULT	SA	0
	SA(immature)	0
	F	1
	F(immature)	1
	Male	1
	UNKNOWN	0
SA	SUBADULT	0
SA(immature)		0
F		0
F(immature)		0
Male		0
UNKNOWN		0

Total HOLD LUMBAR events for SUBADULT.

Partner	Events scored
SA	0
SA(immature)	0
F	1
F(immature)	1
Male	1
UNKNOWN	0

Total directional EMBRACE events for SUBADULT.

Initiator	Recipient	Events scored
SUBADULT	SA	0
	SA(immature)	0
	F	2
	F(immature)	2
	Male	0
	UNKNOWN	0
SA	SUBADULT	0
SA(immature)		0
F		1
F(immature)		0
Male		0
UNKNOWN		0

Total EMBRACE events for SUBADULT.

Partner	Events scored
SA	0
SA(immature)	0
F	12
F(immature)	4
Male	2
UNKNOWN	0

Total directional GREATER BODY CONTACT events for SUBADULT.

Initiator	Recipient	Events scored
SUBADULT	SA	0
	SA(immature)	0
	F	1
	F(immature)	1
	Male	2
	UNKNOWN	0
SA	SUBADULT	0
SA(immature)		0
F		1
F(immature)		3
Male		1
UNKNOWN		0

Total GREATER BODY events for SUBADULT.

Partner	Events scored
SA	0
SA(immature)	0
F	6
F(immature)	11
Male	5
UNKNOWN	0

Total directional OVERALL GROOM events for SUBADULT.

Initiator	Recipient	Events scored
SUBADULT	SA	2
	SA(immature)	0
	F	53
	F(immature)	26
	Male	8
	UNKNOWN	0
SA	SUBADULT	0
SA(immature)		0
F		27
F(immature)		11
Male		2
UNKNOWN		0

Total OVERALL GROOM events for SUBADULT.

Partner	Events scored
SA	2
SA(immature)	0
F	80
F(immature)	37
Male	10
UNKNOWN	0

Total directional OVERALL BODY CONTACT events for SUBADULT.

Initiator	Recipient	Events scored
SUBADULT	SA	0
	SA(immature)	0
	F	8
	F(immature)	6
	Male	5
	UNKNOWN	0
SA	SUBADULT	1
SA(immature)		0
F		2
F(immature)		3
Male		1
UNKNOWN		0

Total OVERALL BODY CONTACT events for SUBADULT.

Partner	Events scored
SA	3
SA(immature)	0
F	30
F(immature)	24
Male	10
UNKNOWN	0

Appendix 2: Breakdown of Unidentified Male behavioural events

Copulations: SA(immature): 1, **F(immature):** 1, **F:** 9

Total directional events for MALE.

Initiator	Recipient	Events scored
MALE	SA	21
	SA(immature)	1
	F	91
	F(immature)	70
	Male	0
	UNKNOWN	1
SA	MALE	25
SA(immature)		7
F		114
F(immature)		55
Male		0
UNKNOWN		1

Total events for MALE.

Partner	Events scored
SA	58
SA(immature)	10
F	379
F(immature)	152
Male	0
UNKNOWN	2

Total directional AFFILIATIVE events for MALE.

Initiator	Recipient	Events scored
MALE	SA	17
	SA(immature)	1
	F	156
	F(immature)	66
	Male	0
	UNKNOWN	0
SA	MALE	25
SA(immature)		7
F		111
F(immature)		55
Male		0
UNKNOWN		1

Total AFFILIATIVE events for MALE.

Partner	Events scored
SA	52
SA(immature)	10
F	341
F(immature)	148
Male	0
UNKNOWN	1

Total directional AGONISITIC events for MALE.

Initiator	Recipient	Events scored
MALE	SA	3
	SA(immature)	0
	F	29
	F(immature)	2
	Male	0
	UNKNOWN	1
SA	MALE	0
SA(immature)		0
F		3
F(immature)		0
Male		0
UNKNOWN		0

Total AGONISITIC events for MALE.

Partner	Events scored
SA	5
SA(immature)	0
F	32
F(immature)	2
Male	0
UNKNOWN	1

Total directional ARM SWIPE events for MALE.

Initiator	Recipient	Events scored
MALE	SA	0
	SA(immature)	0
	F	1
	F(immature)	0
	Male	0
	UNKNOWN	0
SA	MALE	0
SA(immature)		0
F		0
F(immature)		0
Male		0
UNKNOWN		0

Total ARM SWIPE events for MALE.

Partner	Events scored
SA	0
SA(immature)	0
F	1
F(immature)	0
Male	0
UNKNOWN	0

Total directional CHASE events for MALE.

Initiator	Recipient	Events scored
MALE	SA	2
	SA(immature)	0
	F	8
	F(immature)	1
	Male	0
	UNKNOWN	1
SA	MALE	0
SA(immature)		0
F		0
F(immature)		0
Male		0
UNKNOWN		0

Total CHASE events for MALE.

Partner	Events scored
SA	2
SA(immature)	0
F	8
F(immature)	1
Male	0
UNKNOWN	1

Total directional WRESTLE events for MALE.

Initiator	Recipient	Events scored
MALE	SA	0
	SA(immature)	0
	F	2
	F(immature)	0
	Male	0
	UNKNOWN	0
SA	MALE	0
SA(immature)		0
F		0
F(immature)		0
Male		0
UNKNOWN		0

Total WRESTLE events for MALE.

Partner	Events scored
SA	2
SA(immature)	0
F	2
F(immature)	0
Male	0
UNKNOWN	0

Total directional APPROACH(RUN)-RETREAT events for MALE.

Initiator	Recipient	Events scored
MALE	SA	0
	SA(immature)	0
	F	3
	F(immature)	0
	Male	0
	UNKNOWN	0
SA	MALE	0
SA(immature)		0
F		1
F(immature)		0
Male		0
UNKNOWN		0

Total APPROACH(RUN)-RETREAT events for MALE.

Partner	Events scored
SA	0
SA(immature)	0
F	4
F(immature)	0
Male	0
UNKNOWN	0

Total directional APPROACH(WALK)-RETREAT events for MALE.

Initiator	Recipient	Events scored
MALE	SA	1
	SA(immature)	0
	F	11
	F(immature)	0
	Male	0
	UNKNOWN	0
SA	MALE	0
SA(immature)		0
F		0
F(immature)		0
Male		0
UNKNOWN		0

Total APPROACH(WALK)-RETREAT events for MALE.

Partner	Events scored
SA	1
SA(immature)	0
F	11
F(immature)	0
Male	0
UNKNOWN	0

Total directional LUNGE events for MALE.

Initiator	Recipient	Events scored
MALE	SA	0
	SA(immature)	0
	F	4
	F(immature)	0
	Male	0
	UNKNOWN	0
SA	MALE	0
SA(immature)		0
F		2
F(immature)		0
Male		0
UNKNOWN		0

Total LUNGE events for MALE.

Partner	Events scored
SA	0
SA(immature)	0
F	6
F(immature)	0
Male	0
UNKNOWN	0

Total directional DISPLACEMENT events for MALE.

Initiator	Recipient	Events scored
MALE	SA	3
	SA(immature)	0
	F	22
	F(immature)	2
	Male	0
	UNKNOWN	1
SA	MALE	0
SA(immature)		0
F		1
F(immature)		0
Male		0
UNKNOWN		0

Total DISPLACEMENT events for MALE.

Partner	Events scored
SA	3
SA(immature)	0
F	23
F(immature)	2
Male	0
UNKNOWN	1

Total directional GREATER BODY CONTACT events for MALE.

Initiator	Recipient	Events scored
MALE	SA	1
	SA(immature)	0
	F	8
	F(immature)	5
	Male	0
	UNKNOWN	0
SA	MALE	1
SA(immature)		0
F		1
F(immature)		0
Male		0
UNKNOWN		0

Total GREATER BODY CONTACT events for MALE.

Partner	Events scored
SA	3
SA(immature)	1
F	16
F(immature)	8
Male	0
UNKNOWN	0

Total directional LESSER BODY CONTACT events for MALE.

Initiator	Recipient	Events scored
MALE	SA	1
	SA(immature)	0
	F	7
	F(immature)	2
	Male	0
	UNKNOWN	0
SA	MALE	0
SA(immature)		3
F		6
F(immature)		3
Male		0
UNKNOWN		0

Total LESSER BODY CONTACT events for MALE.

Partner	Events scored
SA	1
SA(immature)	3
F	25
F(immature)	11
Male	0
UNKNOWN	0

Total directional BODY CONTACT UNKNOWN AMOUNT events for MALE.

Initiator	Recipient	Events scored
MALE	SA	0
	SA(immature)	0
	F	1
	F(immature)	1
	Male	0
	UNKNOWN	0
SA	MALE	0
SA(immature)		0
F		0
F(immature)		0
Male		0
UNKNOWN		0

Total BODY CONTACT UNKNOWN AMOUNT events for MALE.

Partner	Events scored
SA	0
SA(immature)	0
F	1
F(immature)	3
Male	0
UNKNOWN	0

Total directional PROXIMITY events for MALE.

Initiator	Recipient	Events scored
MALE	SA	13
	SA(immature)	1
	F	106
	F(immature)	39
	Male	0
	UNKNOWN	0
SA	MALE	10
SA(immature)		2
F		45
F(immature)		35
Male		0
UNKNOWN		0

Total PROXIMITY events for MALE.

Partner	Events scored
SA	29
SA(immature)	4
F	188
F(immature)	88
Male	0
UNKNOWN	1

Total directional SINGLE GROOM events for MALE.

Initiator	Recipient	Events scored
MALE	SA	0
	SA(immature)	0
	F	18
	F(immature)	16
	Male	0
	UNKNOWN	0
SA	MALE	12
SA(immature)		1
F		41
F(immature)		11
Male		0
UNKNOWN		0

Total SINGLE GROOM events for MALE.

Partner	Events scored
SA	12
SA(immature)	1
F	59
F(immature)	27
Male	0
UNKNOWN	0

Total directional RECIPROCAL GROOM events for MALE.

Initiator	Recipient	Events scored
MALE	SA	0
	SA(immature)	0
	F	10
	F(immature)	1
	Male	0
	UNKNOWN	0
SA	MALE	0
SA(immature)		0
F		14
F(immature)		2
Male		0
UNKNOWN		0

Total RECIPROCAL GROOM events for MALE.

Partner	Events scored
SA	0
SA(immature)	0
F	24
F(immature)	3
Male	0
UNKNOWN	0

Total directional HOLD LUMBAR events for MALE.

Initiator	Recipient	Events scored
MALE	SA	0
	SA(immature)	0
	F	4
	F(immature)	2
	Male	0
	UNKNOWN	0
SA	MALE	0
SA(immature)		1
F		1
F(immature)		1
Male		0
UNKNOWN		0

Total HOLD LUMBAR events for MALE.

Partner	Events scored
SA	0
SA(immature)	1
F	5
F(immature)	3
Male	0
UNKNOWN	0

Total directional EMBRACE events for MALE.

Initiator	Recipient	Events scored
MALE	SA	2
	SA(immature)	0
	F	2
	F(immature)	0
	Male	0
	UNKNOWN	0
SA	MALE	2
SA(immature)		0
F		3
F(immature)		3
Male		0
UNKNOWN		0

Total EMBRACE events for MALE.

Partner	Events scored
SA	7
SA(immature)	0
F	23
F(immature)	5
Male	0
UNKNOWN	0

Total directional OVERALL GROOM events for MALE.

Initiator	Recipient	Events scored
MALE	SA	0
	SA(immature)	0
	F	28
	F(immature)	17
	Male	0
	UNKNOWN	0
SA	MALE	12
SA(immature)		1
F		55
F(immature)		13
Male		0
UNKNOWN		0

Total OVERALL GROOM events for MALE.

Partner	Events scored
SA	12
SA(immature)	1
F	83
F(immature)	30
Male	0
UNKNOWN	0

Total directional OVERALL BODY CONTACT events for MALE.

Initiator	Recipient	Events scored
MALE	SA	4
	SA(immature)	0
	F	22
	F(immature)	10
	Male	0
	UNKNOWN	0
SA	MALE	3
SA(immature)		4
F		11
F(immature)		7
Male		0
UNKNOWN		0

Total OVERALL BODY CONTACT events for MALE.

Partner	Events scored
SA	11
SA(immature)	5
F	70
F(immature)	30
Male	0
UNKNOWN	0

Appendix 2: Breakdown of Unidentified Female behavioural events

Total directional events for FEMALE.

Initiator	Recipient	Events scored
FEMALE	SA	60
	SA(immature)	5
	F	135
	F(immature)	173
	Male	48
	UNKNOWN	3
SA	FEMALE	75
SA(immature)		23
F		124
F(immature)		88
Male		77
UNKNOWN		0

Total events for FEMALE.

Partner	Events scored
SA	183
SA(immature)	39
F	318
F(immature)	358
Male	152
UNKNOWN	3

Total directional AFFILIATIVE events for FEMALE.

Initiator	Recipient	Events scored
FEMALE	SA	56
	SA(immature)	5
	F	132
	F(immature)	173
	Male	47
	UNKNOWN	3
SA	FEMALE	75
SA(immature)		23
F		123
F(immature)		88
Male		65
UNKNOWN		0

Total AFFILIATIVE events for FEMALE.

Partner	Events scored
SA	179
SA(immature)	39
F	314
F(immature)	358
Male	139
UNKNOWN	3

Total directional AGONISITIC events for FEMALE.

Initiator	Recipient	Events scored
FEMALE	SA	1
	SA(immature)	0
	F	2
	F(immature)	0
	Male	1
	UNKNOWN	0
SA	FEMALE	0
SA(immature)		0
F		2
F(immature)		0
Male		12
UNKNOWN		0

Total AGONISITIC events for FEMALE.

Partner	Events scored
SA	1
SA(immature)	0
F	4
F(immature)	0
Male	13
UNKNOWN	0

Total directional EMBRACE events for FEMALE.

Initiator	Recipient	Events scored
FEMALE	SA	0
	SA(immature)	0
	F	0
	F(immature)	0
	Male	0
	UNKNOWN	0
SA	FEMALE	0
SA(immature)		0
F		0
F(immature)		0
Male		0
UNKNOWN		0

Total EMBRACE events for FEMALE.

Partner	Events scored
SA	0
SA(immature)	0
F	0
F(immature)	0
Male	0
UNKNOWN	0

Total directional ARM SWIPE events for FEMALE.

Initiator	Recipient	Events scored
FEMALE	SA	0
	SA(immature)	0
	F	1
	F(immature)	0
	Male	0
	UNKNOWN	0
SA	FEMALE	0
SA(immature)		0
F		0
F(immature)		0
Male		0
UNKNOWN		0

Total ARM SWIPE events for FEMALE.

Partner	Events scored
SA	0
SA(immature)	0
F	1
F(immature)	0
Male	0
UNKNOWN	0

Total directional CHASE events for FEMALE.

Initiator	Recipient	Events scored
FEMALE	SA	0
	SA(immature)	0
	F	0
	F(immature)	0
	Male	1
	UNKNOWN	0
SA	FEMALE	0
SA(immature)		0
F		0
F(immature)		0
Male		2
UNKNOWN		0

Total CHASE events for FEMALE.

Partner	Events scored
SA	0
SA(immature)	0
F	0
F(immature)	0
Male	3
UNKNOWN	0

Total directional APPROACH(WALK)-RETREAT events for FEMALE.

Initiator	Recipient	Events scored
FEMALE	SA	0
	SA(immature)	0
	F	1
	F(immature)	0
	Male	0
	UNKNOWN	0
SA	FEMALE	0
SA(immature)		0
F		1
F(immature)		0
Male		10
UNKNOWN		0

Total APPROACH(WALK)-RETREAT events for FEMALE.

Partner	Events scored
SA	0
SA(immature)	0
F	2
F(immature)	0
Male	10
UNKNOWN	0

Total directional DISPLACEMENT events for FEMALE.

Initiator	Recipient	Events scored
FEMALE	SA	0
	SA(immature)	0
	F	1
	F(immature)	0
	Male	1
	UNKNOWN	0
SA	FEMALE	0
SA(immature)		0
F		1
F(immature)		0
Male		12
UNKNOWN		0

Total DISPLACEMENT events for FEMALE.

Partner	Events scored
SA	0
SA(immature)	0
F	2
F(immature)	0
Male	13
UNKNOWN	0

Total directional OVERALL GROOM events for FEMALE.

Initiator	Recipient	Events scored
FEMALE	SA	32
	SA(immature)	4
	F	66
	F(immature)	99
	Male	25
	UNKNOWN	1
SA	FEMALE	48
SA(immature)		12
F		65
F(immature)		53
Male		11
UNKNOWN		0

Total OVERALL GROOM events for FEMALE.

Partner	Events scored
SA	80
SA(immature)	16
F	131
F(immature)	152
Male	36
UNKNOWN	1

Total directional OVERALL BODY CONTACT events for FEMALE.

Initiator	Recipient	Events scored
FEMALE	SA	11
	SA(immature)	1
	F	19
	F(immature)	30
	Male	4
	UNKNOWN	0
SA	FEMALE	11
SA(immature)		4
F		7
F(immature)		13
Male		5
UNKNOWN		0

Total OVERALL BODY CONTACT events for FEMALE.

Partner	Events scored
SA	49
SA(immature)	14
F	46
F(immature)	105
Male	25
UNKNOWN	0

Total directional LESSER BODY CONTACT events for FEMALE.

Initiator	Recipient	Events scored
FEMALE	SA	3
	SA(immature)	0
	F	6
	F(immature)	14
	Male	0
	UNKNOWN	0
SA	FEMALE	3
SA(immature)		5
F		6
F(immature)		4
Male		0
UNKNOWN		0

Total LESSER BODY CONTACT events for FEMALE.

Partner	Events scored
SA	19
SA(immature)	12
F	16
F(immature)	37
Male	6
UNKNOWN	0

Total directional PROXIMITY events for FEMALE.

<table>
<tr><th>Initiator</th><th>Recipient</th><th>Events scored</th></tr>
<tr><td rowspan="6">FEMALE</td><td>SA</td><td>13</td></tr>
<tr><td>SA(immature)</td><td>0</td></tr>
<tr><td>F</td><td>47</td></tr>
<tr><td>F(immature)</td><td>44</td></tr>
<tr><td>Male</td><td>18</td></tr>
<tr><td>UNKNOWN</td><td>2</td></tr>
<tr><td>SA</td><td rowspan="6">FEMALE</td><td>16</td></tr>
<tr><td>SA(immature)</td><td>7</td></tr>
<tr><td>F</td><td>51</td></tr>
<tr><td>F(immature)</td><td>22</td></tr>
<tr><td>Male</td><td>49</td></tr>
<tr><td>UNKNOWN</td><td>0</td></tr>
</table>

Total PROXIMITY events for FEMALE.

Partner	Events scored
SA	50
SA(immature)	9
F	135
F(immature)	101
Male	78
UNKNOWN	2

Total directional RECIPROCAL GROOM events for FEMALE.

Initiator	Recipient	Events scored
FEMALE	SA	14
	SA(immature)	0
	F	23
	F(immature)	13
	Male	4
	UNKNOWN	0
SA	FEMALE	11
SA(immature)		1
F		23
F(immature)		24
Male		1
UNKNOWN		0

Total RECIPROCAL GROOM events for FEMALE.

Partner	Events scored
SA	25
SA(immature)	1
F	46
F(immature)	37
Male	5
UNKNOWN	0

Total directional HOLD LUMBAR events for FEMALE.

Initiator	Recipient	Events scored
FEMALE	SA	0
	SA(immature)	0
	F	1
	F(immature)	4
	Male	0
	UNKNOWN	0
SA	FEMALE	1
SA(immature)		0
F		1
F(immature)		1
Male		2
UNKNOWN		0

Total HOLD LUMBAR events for FEMALE.

Partner	Events scored
SA	1
SA(immature)	0
F	2
F(immature)	5
Male	2
UNKNOWN	0

Total directional EMBRACE events for FEMALE.

Initiator	Recipient	Events scored
FEMALE	SA	1
	SA(immature)	0
	F	4
	F(immature)	4
	Male	1
	UNKNOWN	0
SA	FEMALE	0
SA(immature)		0
F		2
F(immature)		1
Male		0
UNKNOWN		0

Total EMBRACE events for FEMALE.

Partner	Events scored
SA	6
SA(immature)	0
F	7
F(immature)	20
Male	9
UNKNOWN	0

Total directional GREATER BODY CONTACT events for FEMALE.

Initiator	Recipient	Events scored
FEMALE	SA	7
	SA(immature)	1
	F	6
	F(immature)	6
	Male	3
	UNKNOWN	0
SA	FEMALE	4
SA(immature)		0
F		1
F(immature)		6
Male		0
UNKNOWN		0

Total GREATER BODY CONTACT events for FEMALE.

Partner	Events scored
SA	23
SA(immature)	2
F	19
F(immature)	38
Male	8
UNKNOWN	0

Total directional BODY CONTACT UNKNOWN AMOUNT events for FEMALE.

Initiator	Recipient	Events scored
FEMALE	SA	0
	SA(immature)	0
	F	2
	F(immature)	2
	Male	0
	UNKNOWN	0
SA	FEMALE	0
SA(immature)		0
F		0
F(immature)		0
Male		0
UNKNOWN		0

Total BODY CONTACT UNKNOWN AMOUNT events for FEMALE.

Partner	Events scored
SA	0
SA(immature)	0
F	2
F(immature)	5
Male	0
UNKNOWN	0

Total directional SINGLE GROOM events for FEMALE.

Initiator	Recipient	Events scored
FEMALE	SA	18
	SA(immature)	4
	F	43
	F(immature)	86
	Male	21
	UNKNOWN	1
SA	FEMALE	37
SA(immature)		11
F		42
F(immature)		29
Male		10
UNKNOWN		0

Total SINGLE GROOM events for FEMALE.

Partner	Events scored
SA	55
SA(immature)	15
F	85
F(immature)	115
Male	31
UNKNOWN	1

Appendix 4: Examples of timed behavioural events (ZNNR).

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
1/12/2005	10:23am	Chase	M-F, OJ	1	91	0
23/05/2005	11:37am	Copulation	M-YSA	0	15	79
30/12/2005	1:18pm	Copulation	M-SA	0	20	56
16/12/2005	10:21am	Copulation	M-SA	0	37	83
1/12/2005	10:38am	Copulation	M-SA	0	5	44
3/11/2005	3:03pm	Copulation	M-SA	0	32	84
18/12/2005	3:06pm	Copulation	M-SA	0	4	25
10/10/2005	3:30pm	Copulation	M-SA	0	16	41
19/05/2005	10:48am	Copulation	M-OSA	0	20	3
22/04/2006	3:01pm	Copulation	M-F(NI)	0	4	29
6/12/2005	1:09pm	Copulation	M-F	0	11	6
3/11/2005	1:20pm	Copulation	M-F	0	16	88
3/11/2005	1:20pm	Copulation	M-F	0	4	93
1/01/2006	1:25pm	Copulation	M-F	0	19	88
26/04/2006	1:28pm	Copulation	M-F	0	17	85
20/12/2005	1:30pm	Copulation	M-F	0	24	22
2/01/2006	1:32pm	Copulation	M-F	0	26	22
2/01/2006	1:32pm	Copulation	M-F	0	22	25
13/04/2006	1:37pm	Copulation	M-F	0	5	79
8/11/2005	1:47pm	Copulation	M-F	0	15	90
1/01/2006	1:47pm	Copulation	M-F	0	30	97
31/12/2005	1:57pm	Copulation	M-F	0	17	13
1/01/2006	1:57pm	Copulation	M-F	0	18	53
9/12/2005	10:03am	Copulation	M-F	0	20	16
1/12/2005	10:17am	Copulation	M-F	0	27	59

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
28/11/2005	10:28am	Copulation	M-F	0	6	53
14/04/2006	10:28am	Copulation	M-F	0	2	0
16/04/2006	10:43am	Copulation	M-F	0	13	47
1/12/2005	10:45am	Copulation	M-F	0	20	19
24/04/2006	11:07am	Copulation	M-F	0	19	16
31/12/2005	11:13am	Copulation	M-F	0	8	47
19/04/2006	11:14am	Copulation	M-F	0	1	94
19/04/2006	11:19am	Copulation	M-F	0	7	88
2/01/2006	11:29am	Copulation	M-F	0	37	88
16/12/2005	11:30am	Copulation	M-F	0	24	72
3/01/2006	11:35am	Copulation	M-F	0	20	38
11/11/2005	11:57am	Copulation	M-F	0	24	3
28/04/2006	12:02pm	Copulation	M-F	0	5	60
24/04/2006	12:07pm	Copulation	M-F	0	8	6
23/05/2005	12:15pm	Copulation	M-F	0	19	75
16/12/2005	12:30pm	Copulation	M-F	0	20	66
10/10/2005	12:43pm	Copulation	M-F	0	6	88
1/01/2006	2:15pm	Copulation	M-F	0	18	72
6/11/2005	2:20pm	Copulation	M-F	0	23	69
19/04/2006	2:23pm	Copulation	M-F	0	4	57
17/04/2006	2:24pm	Copulation	M-F	0	11	48
2/11/2005	2:32pm	Copulation	M-F	0	19	32
24/04/2006	2:33pm	Copulation	M-F	0	14	94
18/12/2005	2:44pm	Copulation	M-F	0	34	72
6/11/2005	2:46pm	Copulation	M-F	0	18	31
17/10/2005	2:53pm	Copulation	M-F	0	17	30
8/01/2006	3:00pm	Copulation	M-F	0	13	41
3/11/2005	3:09pm	Copulation	M-F	0	19	53

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
2/01/2006	3:13pm	Copulation	M-F	0	15	72
20/04/2006	3:43pm	Copulation	M-F	0	9	22
18/04/2006	4:11pm	Copulation	M-F	0	11	25
9/12/2005	9:46am	Copulation	M-F	0	22	13
25/05/2005	11:36am	Embrace	YSA(NI)-F	5	0	50
24/07/2005	3:54pm	Embrace	SA-NI	0	13	6
1/12/2005	10:26am	Embrace	SA-J	0	2	59
15/05/2005	3:20pm	Embrace	SA(SA) UKI	0	8	87
15/05/2005	3:21pm	Embrace	SA(SA) UKI	0	39	86
15/05/2005	3:25pm	Embrace	SA(SA) UKI	1	34	44
23/07/2005	10:13am	Embrace	OSA(F) UKI	0	16	84
6/11/2005	10:10am	Embrace	M(OJ) UKI	0	12	3
7/08/2005	3:31pm	Embrace	M(OJ) UKI	0	9	6
9/12/2005	10:50am	Embrace	M(F) UKI	0	11	19
9/01/2006	11:31am	Embrace	M(F) UKI	7	55	28
9/12/2005	11:40am	Embrace	M(F) UKI	1	4	58
17/04/2006	11:15am	Embrace	J(SA) UKI	2	35	94
17/04/2006	1:51pm	Embrace	J(J) UKI	1	6	6
21/05/2005	5:06pm	Embrace	J(J) UKI	0	3	44
25/05/2005	12:38pm	Embrace	F-YSA(NI)	0	10	25

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
24/05/2005	10:07am	Embrace	F-YJ	30	44	0
4/05/2005	1:55pm	Embrace	F-OJ	0	5	52
16/04/2006	2:30pm	Embrace	F-J	0	8	97
4/05/2005	1:55pm	Embrace	F-F(NI)	0	24	28
2/11/2005	11:31am	Embrace	F(YJ/J) UKI	0	4	72
30/07/2005	10:00am	Embrace	F(YJ) UKI	0	31	19
23/05/2005	4:07pm	Embrace	F(YJ) UKI	0	4	62
30/10/2005	2:54pm	Embrace	F(OI/YJ)(M) UKI	0	6	10
23/04/2006	1:32pm	Embrace	F(OI)(M)	0	6	65
15/04/2006	2:08am	Embrace	F(NI)-F	0	6	11
6/05/2005	10:59am	Embrace	F(NI)(M) UKI	0	3	19
23/05/2005	12:10pm	Embrace	F(NI)(F)	0	4	50
25/05/2005	11:03am	Embrace	F(NI) UKI	1	27	78
13/04/2006	12:05pm	Embrace	F(NI) UKI	0	13	88
19/05/2005	1:30pm	Embrace	F(M) UKI	0	16	63
18/04/2006	10:18am	Embrace	F(M) UKI	0	11	1
18/04/2006	12:14pm	Embrace	F(M) UKI	0	4	59
14/04/2006	3:17pm	Embrace	F(M) UKI	0	14	81
19/04/2006	9:27am	Embrace	F(M) UKI	0	9	15
7/08/2005	11:00am	Embrace	F(J) UKI	0	4	65
18/12/2005	12:17pm	Embrace	F(F) UKI	0	21	59

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
6/11/2005	12:25pm	Embrace	F(F) UKI	0	5	43
21/05/2005	4:35pm	Embrace	F(F) UKI	0	8	3
2/12/2005	9:56am	Embrace	F(F) UKI	0	13	78
19/04/2006	2:44pm	Pseud-copulation/ Playmount	OJ-OJ	0	4	41
22/05/2005	3:36pm	Pseudo-copulation	F-SA	0	11	34
15/04/2006	11:39am	Pseudocopulation/Play mount	OJ-OJ	0	7	75
26/07/2005	1:00pm	Reciprocal groom	YSA-F(ONI)	5	1	25
25/05/2005	12:44pm	Reciprocal groom	YSA(NI)-F	1	21	88
6/12/2005	1:01pm	Reciprocal groom	SA-F(OI)	4	16	9
24/05/2005	3:14pm	Reciprocal groom	SA-F(NI)	1	15	69
29/11/2005	1:00pm	Reciprocal groom	SA-F	7	58	22
30/11/2005	2:39pm	Reciprocal groom	OJ-YSA	1	16	69
2/12/2005	11:31am	Reciprocal groom	OJ-OJ	4	2	44
29/10/2005	2:35pm	Reciprocal groom	OJ-OJ	4	53	94
3/05/2005	3:39pm	Reciprocal groom	OI-F	1	31	28

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
23/05/2005	1:30pm	Reciprocal groom	M-F(NI)	4	4	15
2/05/2005	1:10pm	Reciprocal groom	M-F	3	23	97
22/04/2006	1:30pm	Reciprocal groom	M-F	20	21	53
2/05/2005	10:40am	Reciprocal groom	M-F	1	46	19
2/05/2005	10:45am	Reciprocal groom	M-F	3	21	46
21/05/2005	12:43pm	Reciprocal groom	M-F	4	17	34
29/04/2006	12:45pm	Reciprocal groom	M-F	2	47	13
8/11/2005	12:49pm	Reciprocal groom	M-F	6	48	3
22/04/2006	3:52pm	Reciprocal groom	M-F	4	33	90
11/04/2005	11:22am	Reciprocal groom	J-F(NI)	3	11	60
25/05/2005	11:41am	Reciprocal groom	F-YSA(NI)	3	49	9
24/05/2005	2:41pm	Reciprocal groom	F-YSA(NI)	2	14	17
29/11/2005	1:00pm	Reciprocal groom	F-SA	9	12	12
29/11/2005	1:19pm	Reciprocal groom	F-SA	1	29	31

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
18/05/2005	12:10pm	Reciprocal groom	F-SA	1	52	74
29/04/2006	2:30pm	Reciprocal groom	F-SA	0	28	48
12/05/2005	9:26am	Reciprocal groom	F-SA	2	12	9
2/05/2005	3:52pm	Reciprocal groom	F-OJ	8	3	23
3/05/2005	3:45pm	Reciprocal groom	F-OI	2	49	6
29/04/2006	12:36pm	Reciprocal groom	F-M	4	8	69
2/05/2005	3:27pm	Reciprocal groom	F-M	1	34	75
19/04/2006	9:46am	Reciprocal groom	F-M	3	5	81
15/04/2006	11:11am	Reciprocal groom	F-F(NI)	0	14	50
24/07/2005	10:06am	Reciprocal groom	F-F	2	51	50
19/05/2005	10:15am	Reciprocal groom	F-F	10	26	12
24/07/2005	10:20am	Reciprocal groom	F-F	1	17	78
19/05/2005	10:26am	Reciprocal groom	F-F	2	30	81
19/05/2005	10:29am	Reciprocal groom	F-F	3	50	38

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
26/04/2006	10:34am	Reciprocal groom	F-F	7	1	35
19/05/2005	10:35am	Reciprocal groom	F-F	1	16	10
14/04/2006	11:04am	Reciprocal groom	F-F	1	41	30
22/05/2005	11:58am	Reciprocal groom	F-F	4	34	75
23/05/2005	12:11pm	Reciprocal groom	F-F	0	55	59
23/05/2005	12:11pm	Reciprocal groom	F-F	4	14	65
20/04/2006	12:46pm	Reciprocal groom	F-F	5	29	65
29/04/2006	12:54pm	Reciprocal groom	F-F	9	51	73
24/05/2005	2:27pm	Reciprocal groom	F-F	3	17	60
24/05/2005	2:29pm	Reciprocal groom	F-F	4	24	60
24/05/2005	2:44pm	Reciprocal groom	F-F	5	13	97
2/11/2005	2:45pm	Reciprocal groom	F-F	1	15	25
24/05/2005	2:49pm	Reciprocal groom	F-F	6	10	3
30/04/2005	3:52pm	Reciprocal groom	F-F	6	43	77

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
6/12/2005	12:54pm	Reciprocal groom	F(OI)-SA	3	45	74
1/12/2005	11:32am	Reciprocal groom	F(OI)-F	0	53	12
4/05/2005	10:15am	Reciprocal groom	F(NI)-OJ	1	33	3
22/05/2005	11:12am	Reciprocal groom	F(NI)-J	2	17	31
20/05/2005	1:42pm	Reciprocal groom	F(NI)-F	4	26	34
24/04/2006	12:40pm	Reciprocal groom	F(NI)-F	4	44	90
29/11/2005	12:55pm	Reciprocal groom		5	45	44
30/11/2005	2:40pm	Self groom	YSA	0	16	3
28/07/2005	2:42pm	Self groom	YSA	1	23	53
28/04/2006	2:47pm	Self groom	YSA	3	51	10
6/12/2005	12:33pm	Self groom	YJ	0	10	63
8/11/2005	1:34pm	Self groom	SA	2	2	63
8/11/2005	1:36pm	Self groom	SA	9	28	69
18/05/2005	1:40pm	Self groom	SA	0	23	6
7/12/2005	12:00pm	Self groom	SA	2	9	78
29/11/2005	12:20pm	Self groom	SA	0	5	47
6/12/2005	12:48pm	Self groom	SA	1	14	97
31/12/2005	12:49pm	Self groom	SA	0	51	75
18/12/2005	2:48pm	Self groom	SA	1	29	22
18/12/2005	10:57am	Self groom	SA	0	12	34
16/12/2005	11:14am	Self groom	SA	1	11	57
18/12/2005	11:46am	Self groom	SA	0	37	44

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
7/12/2005	11:48am	Self groom	SA	0	18	16
1/08/2005	2:27pm	Self groom	OSA	0	49	9
20/04/2006	10:55am	Self groom	OJ (NI)	0	47	50
25/05/2005	11:33am	Self groom	OJ (NI)	0	50	63
18/12/2005	11:10am	Self groom	OJ	0	8	56
5/08/2005	1:33pm	Self groom	OJ	2	7	59
7/12/2005	1:34pm	Self groom	OJ	1	3	0
29/11/2005	12:26pm	Self groom	OJ	0	5	43
19/04/2006	1:10pm	Self groom	M	2	48	34
30/12/2005	1:12pm	Self groom	M	0	36	22
22/04/2006	1:26pm	Self groom	M	1	36	57
16/04/2006	1:27pm	Self groom	M	0	38	35
12/05/2005	1:29pm	Self groom	M	0	32	6
12/05/2005	1:30pm	Self groom	M	0	33	31
29/11/2005	1:32pm	Self groom	M	0	17	90
29/11/2005	1:37pm	Self groom	M	0	31	92
17/04/2006	1:55pm	Self groom	M	0	48	19
28/11/2005	10:04am	Self groom	M	1	39	50
16/04/2006	10:04am	Self groom	M	0	45	57
30/11/2005	10:08am	Self groom	M	0	40	28
23/04/2005	10:30am	Self groom	M	2	13	38
2/05/2005	10:30am	Self groom	M	1	46	53
2/12/2005	10:39am	Self groom	M	0	26	29
19/04/2006	10:48am	Self groom	M	0	21	28
23/05/2005	10:51am	Self groom	M	0	22	67
23/05/2005	10:52am	Self groom	M	0	34	22
24/04/2006	10:55am	Self groom	M	1	56	88
29/11/2005	11:05am	Self groom	M	3	13	96

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
29/04/2006	11:12am	Self groom	M	0	13	9
30/04/2005	11:15am	Self groom	M	0	13	21
30/04/2005	11:15am	Self groom	M	0	13	31
24/05/2005	11:27am	Self groom	M	1	11	86
12/05/2005	11:44am	Self groom	M	0	18	3
30/11/2005	11:44am	Self groom	M	0	42	37
6/11/2005	11:53am	Self groom	M	0	46	10
18/04/2006	11:53am	Self groom	M	1	21	51
12/05/2005	12:03pm	Self groom	M	0	20	9
18/04/2006	12:21pm	Self groom	M	2	31	56
26/04/2006	12:42pm	Self groom	M	0	16	68
18/04/2006	12:51pm	Self groom	M	0	40	28
5/05/2005	2:04pm	Self groom	M	2	0	56
14/04/2006	2:09pm	Self groom	M	0	32	81
12/05/2005	2:14pm	Self groom	M	0	17	97
11/04/2005	2:15pm	Self groom	M	0	28	0
6/05/2005	2:15pm	Self groom	M	0	28	0
19/05/2005	2:43pm	Self groom	M	0	46	97
28/04/2006	3:11pm	Self groom	M	0	51	6
28/04/2006	3:13pm	Self groom	M	1	10	94
24/05/2005	3:44pm	Self groom	M	0	17	75
12/04/2005	9:11am	Self groom	M	1	33	3
12/04/2005	9:11am	Self groom	M	1	50	55
12/04/2005	9:15am	Self groom	M	0	10	38
12/05/2005	9:29am	Self groom	M	0	22	19
11/04/2006	9:38am	Self groom	M	0	58	0

Date	**Time***	**Behav. events**	**Initiator - Recipient**	**Duration of event**		
				minutes	**seconds**	**split seconds**
6/05/2005	9:51am	Self groom	M	0	55	3
13/04/2006	1:15pm	Self groom	J	1	23	40
6/08/2005	1:36pm	Self groom	J	1	0	55
19/12/2005	1:57pm	Self groom	J	0	25	47
28/07/2005	10:00am	Self groom	J	0	52	30
28/07/2005	10:01am	Self groom	J	0	15	90
11/10/2005	11:20am	Self groom	J	0	25	25
11/04/2005	11:28am	Self groom	J	0	48	37
24/05/2005	11:47am	Self groom	J	0	27	9
20/12/2005	11:50am	Self groom	J	0	17	22
5/08/2005	12:17pm	Self groom	J	1	15	63
30/07/2005	2:00pm	Self groom	J	0	33	38
24/05/2005	3:46pm	Self groom	J	0	58	22
20/05/2005	10:18am	Self groom	F(YJ)	0	10	94
25/05/2005	2:46pm	Self groom	F(YJ)	0	37	87
25/05/2005	2:47pm	Self groom	F(YJ)	0	25	91
24/05/2005	3:28pm	Self groom	F(YJ)	0	6	75
25/07/2005	1:59pm	Self groom	F(OJ)	0	19	34
28/04/2006	10:31am	Self groom	F(OI/YJ)	0	41	38
30/12/2005	10:43am	Self groom	F(OI)	0	9	14
20/04/2006	11:15am	Self groom	F(OI)	0	21	88
22/04/2006	11:18am	Self groom	F(OI)	0	11	22
11/10/2005	11:22am	Self groom	F(OI)	0	47	37
9/11/2005	11:36am	Self groom	F(OI)	0	57	62
4/05/2005	10:15am	Self groom	F(NI)	0	59	96

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
4/05/2005	10:27am	Self groom	F(NI)	0	22	71
19/05/2005	10:52am	Self groom	F(NI)	0	15	44
20/04/2006	10:53am	Self groom	F(NI)	0	25	15
25/05/2005	11:04am	Self groom	F(NI)	0	8	31
19/05/2005	11:11am	Self groom	F(NI)	0	7	53
19/05/2005	11:11am	Self groom	F(NI)	2	43	97
19/05/2005	11:19am	Self groom	F(NI)	0	25	3
19/05/2005	11:20am	Self groom	F(NI)	0	13	22
20/04/2006	11:24am	Self groom	F(NI)	0	31	84
4/05/2005	11:35am	Self groom	F(NI)	1	44	0
25/05/2005	11:50am	Self groom	F(NI)	0	48	66
3/05/2005	9:16am	Self groom	F(NI)	0	31	31
6/05/2005	9:45am	Self groom	F(NI)	0	20	42
15/04/2006	1:17pm	Self groom	F(NI)	3	49	42
21/05/2005	1:44pm	Self groom	F(NI)	0	57	25
13/04/2006	12:01pm	Self groom	F(NI)	0	7	91
16/04/2006	12:38pm	Self groom	F(NI)	0	17	22
1/05/2005	12:55pm	Self groom	F(NI)	0	11	91
26/07/2005	11:58am	Self groom	F(?)	4	50	96
28/04/2006	1:56pm	Self groom	F (OI)	0	12	28
13/04/2006	12:15pm	Self groom	F (OI)	0	19	41
26/04/2006	12:23pm	Self groom	F (OI)	0	9	50
26/04/2006	12:26pm	Self groom	F (OI)	1	29	12
30/12/2005	12:30pm	Self groom	F (OI)	0	19	47
22/04/2006	2:11pm	Self groom	F (OI)	0	50	56
26/04/2006	2:50pm	Self groom	F (OI)	0	6	9
26/04/2006	2:56pm	Self groom	F (OI)	0	24	63
3/01/2006	1:10pm	Self groom	F	0	48	47

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
24/04/2006	1:13pm	Self groom	F	5	21	6
16/04/2006	1:18pm	Self groom	F	0	31	16
16/04/2006	1:18pm	Self groom	F	0	43	21
16/04/2006	1:21pm	Self groom	F	0	10	28
19/04/2006	1:22pm	Self groom	F	0	34	34
6/08/2005	1:22pm	Self groom	F	2	10	50
19/05/2005	1:24pm	Self groom	F	0	3	60
19/05/2005	1:27pm	Self groom	F	0	5	53
20/05/2005	1:27pm	Self groom	F	2	13	67
28/04/2006	1:28pm	Self groom	F	0	38	41
28/07/2005	1:30pm	Self groom	F	4	12	91
24/05/2005	1:39pm	Self groom	F	0	9	19
20/05/2005	1:42pm	Self groom	F	0	26	46
20/05/2005	1:44pm	Self groom	F	0	37	69
24/05/2005	1:45pm	Self groom	F	0	8	77
3/01/2006	1:51pm	Self groom	F	2	27	78
16/04/2006	1:52pm	Self groom	F	1	3	31
24/05/2005	1:5opm	Self groom	F	0	12	53
26/07/2005	10:04am	Self groom	F	6	40	65
25/07/2005	10:07am	Self groom	F	0	28	56
16/04/2006	10:13am	Self groom	F	0	4	60
26/07/2005	10:17am	Self groom	F	0	48	37
18/04/2006	10:17am	Self groom	F	0	12	10
26/04/2006	10:18am	Self groom	F	0	21	35
26/07/2005	10:18am	Self groom	F	0	56	49
26/04/2006	10:20am	Self groom	F	1	11	91
16/04/2006	10:20am	Self groom	F	0	16	0
2/12/2005	10:21am	Self groom	F	1	7	66

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
26/04/2006	10:22am	Self groom	F	1	49	93
12/05/2005	10:25am	Self groom	F	5	31	6
12/05/2005	10:25am	Self groom	F	0	20	32
12/05/2005	10:25am	Self groom	F	0	25	41
26/04/2006	10:26am	Self groom	F	0	31	31
28/11/2005	10:27am	Self groom	F	0	13	3
23/05/2005	10:33am	Self groom	F	0	9	37
23/05/2005	10:36am	Self groom	F	0	35	72
19/04/2006	10:37am	Self groom	F	0	56	13
11/04/2005	10:39am	Self groom	F	1	20	56
28/04/2006	10:40am	Self groom	F	1	25	22
22/04/2006	10:41am	Self groom	F	0	7	91
28/07/2005	10:48am	Self groom	F	0	57	69
26/04/2006	10:52am	Self groom	F	0	59	31
23/07/2005	10:55am	Self groom	F	0	55	37
11/04/2005	11:00am	Self groom	F	0	33	35
15/04/2006	11:00am	Self groom	F	2	53	63
23/04/2006	11:05am	Self groom	F	1	16	93
16/04/2006	11:07am	Self groom	F	2	2	32
23/04/2006	11:09am	Self groom	F	0	41	56
14/04/2006	11:10am	Self groom	F	1	17	13
14/04/2006	11:12am	Self groom	F	2	26	59
14/04/2006	11:12am	Self groom	F	0	45	94
26/04/2006	11:12am	Self groom	F	0	9	90
14/04/2006	11:13am	Self groom	F	0	11	72
25/05/2005	11:17am	Self groom	F	0	33	50
16/10/2005	11:27am	Self groom	F	0	43	16

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
18/12/2005	11:29am	Self groom	F	1	14	6
18/12/2005	11:29am	Self groom	F	0	50	84
24/07/2005	11:30am	Self groom	F	1	49	88
16/04/2006	11:31am	Self groom	F	0	56	73
18/04/2006	11:31am	Self groom	F	1	14	78
18/12/2005	11:35am	Self groom	F	2	57	50
31/10/2005	11:40am	Self groom	F	4	33	37
20/12/2005	11:46am	Self groom	F	0	23	53
20/12/2005	11:48am	Self groom	F	0	39	82
15/04/2006	11:48am	Self groom	F	1	1	45
29/11/2005	11:50am	Self groom	F	0	29	56
18/12/2005	11:56am	Self groom	F	1	16	35
7/01/2006	11:58am	Self groom	F	0	16	32
8/01/2006	11:58am	Self groom	F	1	5	53
6/12/2005	12:00pm	Self groom	F	2	13	47
26/04/2006	12:00pm	Self groom	F	1	35	44
7/01/2006	12:04pm	Self groom	F	1	21	15
22/05/2005	12:05pm	Self groom	F	0	10	32
25/07/2005	12:06pm	Self groom	F	0	41	25
29/11/2005	12:24pm	Self groom	F	0	6	50
6/12/2005	12:25pm	Self groom	F	1	57	12
2/05/2005	12:34pm	Self groom	F	0	26	35
6/11/2005	12:35pm	Self groom	F	1	9	19
16/04/2006	12:42pm	Self groom	F	0	10	90
11/04/2005	12:42pm	Self groom	F	1	32	31
19/05/2005	2:00pm	Self groom	F	0	39	22
19/05/2005	2:10pm	Self groom	F	5	20	40

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
24/05/2005	2:10pm	Self groom	F	0	40	62
22/05/2005	2:16pm	Self groom	F	0	43	12
22/05/2005	2:16pm	Self groom	F	1	15	97
20/04/2006	2:18pm	Self groom	F	0	11	0
24/05/2005	2:19pm	Self groom	F	0	19	47
30/12/2005	2:20pm	Self groom	F	1	49	37
18/04/2006	2:29pm	Self groom	F	0	23	81
22/05/2005	2:29pm	Self groom	F	0	15	15
18/12/2005	2:35pm	Self groom	F	0	4	90
19/05/2005	2:35pm	Self groom	F	0	9	22
29/04/2006	2:36pm	Self groom	F	0	25	53
18/12/2005	2:38pm	Self groom	F	0	12	16
25/07/2005	2:47pm	Self groom	F	2	11	6
25/05/2005	2:50pm	Self groom	F	0	14	13
19/04/2006	2:52pm	Self groom	F	1	37	87
18/12/2005	2:55pm	Self groom	F	0	12	38
18/04/2006	2:57pm	Self groom	F	0	18	22
14/04/2006	2:58pm	Self groom	F	0	32	22
14/04/2006	2:58pm	Self groom	F	0	42	88
14/04/2006	3:00pm	Self groom	F	0	22	0
14/04/2006	3:00pm	Self groom	F	0	16	6
23/04/2005	3:08pm	Self groom	F	2	5	6
23/04/2005	3:08pm	Self groom	F	0	23	63
2/12/2005	3:11pm	Self groom	F	0	3	19
23/05/2005	3:13pm	Self groom	F	0	18	0
6/11/2005	3:13pm	Self groom	F	0	17	72
22/04/2006	3:14pm	Self groom	F	0	15	62
22/05/2005	3:19pm	Self groom	F	0	14	50

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
19/04/2006	3:28pm	Self groom	F	4	21	0
22/05/2005	3:29pm	Self groom	F	0	11	40
22/05/2005	3:36pm	Self groom	F	0	36	3
17/04/2006	3:41pm	Self groom	F	0	43	82
21/05/2005	3:44pm	Self groom	F	0	25	31
19/04/2006	3:45pm	Self groom	F	0	28	97
				minutes	**seconds**	**split seconds**
17/04/2006	3:46pm	Self groom	F	1	19	79
24/05/2005	3:56pm	Self groom	F	1	37	34
23/05/2005	4:03pm	Self groom	F	0	10	50
24/05/2005	4:03pm	Self groom	F	1	52	59
24/05/2005	4:03pm	Self groom	F	0	50	63
23/05/2005	4:14pm	Self groom	F	0	40	35
22/07/2005	4:14pm	Self groom	F	1	38	22
24/05/2005	4:15pm	Self groom	F	0	13	0
23/05/2005	4:30pm	Self groom	F	0	9	65
21/05/2005	4:33pm	Self groom	F	0	57	67
21/05/2005	4:37pm	Self groom	F	0	21	71
12/04/2005	9:08am	Self groom	F	4	33	34
11/04/2006	9:25am	Self groom	F	1	17	68
3/05/2005	9:26am	Self groom	F	0	43	18
24/07/2005	9:30am	Self groom	F	0	37	79
16/04/2006	9:40am	Self groom	F	0	3	74
30/07/2005	2:19pm	Single groom	YSA-ONI	0	56	77
21/05/2005	1:01pm	Single groom	YSA-NI	0	56	22

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
23/05/2005	11:15am	Single groom	YSA-NI	0	16	41
23/05/2005	11:18am	Single groom	YSA-NI	1	29	56
21/05/2005	1:00pm	Single groom	YSA(NI)-F(YJ)	0	28	85
23/05/2005	11:14am	Single groom	YSA(NI)-F	0	47	15
25/05/2005	12:05pm	Single groom	YSA(NI)-F	1	4	66
25/05/2005	12:49pm	Single groom	YSA(NI)-F	1	18	31
21/05/2005	1:10pm	Single groom	YSA(?)-F(YJ)	4	41	87
22/05/2005	11:23am	Single groom	YJ-F	1	0	72
25/05/2005	11:04am	Single groom	YF-F(NI)	0	51	65
25/05/2005	11:10am	Single groom	YF-F	0	21	72
25/05/2005	11:21am	Single groom	YF(NI)-F	0	10	12
15/05/2005	3:20pm	Single groom	SA-SA	0	40	90
15/05/2005	3:23pm	Single groom	SA-SA	1	25	9
15/05/2005	3:27pm	Single groom	SA-SA	1	7	60

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
18/12/2005	1:59pm	Single groom	SA-OI	3	7	50
30/12/2005	11:42am	Single groom	SA-OI	0	55	0
18/12/2005	2:02pm	Single groom	SA-OI	1	17	59
18/12/2005	2:13pm	Single groom	SA-OI	3	59	6
18/12/2005	2:21pm	Single groom	SA-OI	0	9	40
23/05/2005	11:37am	Single groom	SA-M	3	11	71
16/12/2005	12:53pm	Single groom	SA-M	3	3	75
16/12/2005	2:53pm	Single groom	SA-M	1	45	8
18/12/2005	3:09pm	Single groom	SA-M	1	8	75
17/04/2006	11:42am	Single groom	SA-J	4	13	6
20/04/2006	11:57am	Single groom	SA-J	6	50	88
12/05/2005	9:30am	Single groom	SA-FM	0	25	81
6/11/2005	11:57am	Single groom	SA-F(OI)	2	20	78
6/12/2005	12:53pm	Single groom	SA-F(OI)	0	42	38

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
24/05/2005	3:16pm	Single groom	SA-F(NI)	3	8	31
30/04/2005	4:55pm	Single groom	SA-F(NI)	0	5	10
8/11/2005	1:53pm	Single groom	SA-F	4	10	44
18/12/2005	11:31am	Single groom	SA-F	6	3	31
6/12/2005	11:50am	Single groom	SA-F	5	29	69
6/12/2005	12:00pm	Single groom	SA-F	3	5	47
6/11/2005	3:07pm	Single groom	SA-F	2	15	0
11/04/2005	2:38pm	Single groom	SA(NI)-FM	0	52	31
6/05/2005	2:43pm	Single groom	SA(NI)-FM	0	52	71
20/05/2005	10:40am	Single groom	SA(NI)-F(YJ)	2	11	0
20/05/2005	10:49am	Single groom	SA(NI)-F(YJ)	1	23	19
12/05/2005	10:25am	Single groom	SA(NI)-F	1	24	32
15/04/2006	3:31pm	Single groom	SA - M	0	33	87
1/08/2005	2:44pm	Single groom	OSA-OSA	1	47	95

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
1/08/2005	2:48pm	Single groom	OSA-OSA	1	20	49
22/05/2005	10:20am	Single groom	OSA-NI	1	6	47
19/05/2005	10:53am	Single groom	OSA-F(NI)	0	38	65
19/05/2005	10:55am	Single groom	OSA-F(NI)	2	7	25
19/05/2005	11:38am	Single groom	OSA-F(NI)	1	26	0
28/04/2006	2:35pm	Single groom	OSA - F(NI)	0	23	22
26/07/2005	2:00pm	Single groom	OJ-YJ	3	3	69
7/08/2005	3:27pm	Single groom	OJ-YI	0	47	57
20/05/2005	10:20am	Single groom	OJ-SA(NI)	2	20	94
20/05/2005	10:23am	Single groom	OJ-SA(NI)	1	8	75
20/05/2005	10:25am	Single groom	OJ-SA(NI)	0	10	69
2/12/2005	11:22am	Single groom	OJ-OJ	9	6	65
17/10/2005	10:57am	Single groom	OJ-OI	2	46	19
17/10/2005	11:00am	Single groom	OJ-OI	4	33	35

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
25/05/2005	11:18am	Single groom	OJ-NI	1	9	94
30/12/2005	1:04pm	Single groom	OJ-M	8	23	12
12/05/2005	1:40pm	Single groom	OJ-M	2	30	15
12/05/2005	1:40pm	Single groom	OJ-M	0	30	87
12/04/2005	9:15am	Single groom	OJ-FM	1	5	32
2/12/2005	11:36am	Single groom	OJ-F(OI)	2	29	91
12/04/2005	9:15am	Single groom	OJ-F(I)	1	47	55
12/04/2005	9:15am	Single groom	OJ-F	0	16	12
24/07/2005	9:31am	Single groom	OJ-F	1	46	59
22/05/2005	3:30pm	Single groom	OJ/YSA-F(NI)	1	37	44
25/05/2005	12:31pm	Single groom	OJ/OSA-NI	0	10	22
12/05/2005	2:12pm	Single groom	OJ(NI)-M	2	19	75
20/04/2006	11:01am	Single groom	OJ(NI) - F	0	32	35
20/04/2006	12:01pm	Single groom	OJ - F(OI)(NI)	1	46	98

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
3/05/2005	3:45pm	Single groom	OI-M	0	37	22
5/05/2005	11:17am	Single groom	OI/YJ-F	0	33	19
14/04/2006	11:33am	Single groom	M-J	0	13	56
14/04/2006	11:36am	Single groom	M-J	0	6	81
28/07/2005	9:27am	Single groom	M-F(ONI)	6	48	66
31/10/2005	4:04pm	Single groom	M-F(OJ)	0	22	60
17/04/2006	3:28pm	Single groom	M-F(OI)	1	27	67
5/05/2005	11:32am	Single groom	M-F(NI)	4	34	6
2/05/2005	10:17am	Single groom	M-F	3	24	94
11/04/2006	10:36am	Single groom	M-F	0	21	84
30/04/2005	11:45am	Single groom	M-F	6	11	58
11/04/2005	2:03pm	Single groom	M-F	1	29	66
20/04/2005	2:08pm	Single groom	M-F	0	27	34
6/05/2005	2:30pm	Single groom	M-F	1	29	66

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
18/12/2005	2:36pm	Single groom	M-F	0	33	78
28/04/2006	2:42pm	Single groom	M-F	2	21	28
25/10/2005	2:57pm	Single groom	M-F	4	58	28
25/10/2005	3:02pm	Single groom	M-F	2	7	84
2/05/2005	3:24pm	Single groom	M-F	7	49	69
20/04/2006	12:21pm	Single groom	M - F	4	59	34
5/08/2005	12:51pm	Single groom	J-YJ	1	54	50
6/05/2005	9:40am	Single groom	J-NI	0	28	53
20/04/2005	2:11pm	Single groom	J-M	0	38	44
6/05/2005	9:42am	Single groom	J-M	2	33	74
7/12/2005	1:22pm	Single groom	J-J	7	31	88
17/04/2006	3:27pm	Single groom	J-J	3	3	3

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
20/05/2005	10:12am	Single groom	J-F(YJ)	0	22	34
20/05/2005	10:18am	Single groom	J-F(YJ)	0	23	3
20/05/2005	10:18am	Single groom	J-F(YJ)	0	30	50
21/05/2005	12:01pm	Single groom	J-F(YJ)	0	27	96
20/05/2005	9:59am	Single groom	J-F(YJ)	0	56	25
20/05/2005	9:59am	Single groom	J-F(YJ)	0	11	35
15/04/2006	1:09pm	Single groom	J-F(NI)	0	33	51
22/05/2005	11:12am	Single groom	J-F(NI)	0	26	50
22/05/2005	10:25am	Single groom	J-F	0	44	96
22/05/2005	10:34am	Single groom	J-F	0	19	0
22/05/2005	10:35am	Single groom	J-F	0	32	90
2/05/2005	3:48pm	Single groom	J-F	4	54	37
30/04/2005	3:16pm	Single groom	I-F	5	30	58
25/05/2005	11:54am	Single groom	F-YSA(NI)	0	19	97

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
25/05/2005	12:11pm	Single groom	F-YSA(NI)	3	7	55
21/05/2005	1:17pm	Single groom	F-YSA	2	56	32
21/05/2005	1:56pm	Single groom	F-YJ	5	34	7
30/07/2005	10:08am	Single groom	F-YJ	0	28	56
24/05/2005	11:21am	Single groom	F-YJ	2	36	88
21/05/2005	11:47am	Single groom	F-YJ	1	48	37
16/10/2005	11:48am	Single groom	F-YJ	2	50	6
19/05/2005	12:13pm	Single groom	F-YJ	0	37	63
6/08/2005	12:37pm	Single groom	F-YJ	4	19	56
22/05/2005	2:20pm	Single groom	F-YJ	0	28	53
22/05/2005	2:23pm	Single groom	F-YJ	3	37	87
22/05/2005	2:29pm	Single groom	F-YJ	1	3	13
29/10/2005	2:32pm	Single groom	F-YJ	0	42	60
22/05/2005	2:33pm	Single groom	F-YJ	2	37	41

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
22/05/2005	2:35pm	Single groom	F-YJ	1	8	40
22/05/2005	2:42pm	Single groom	F-YJ	2	46	16
25/05/2005	2:47pm	Single groom	F-YJ	1	11	25
25/05/2005	2:47pm	Single groom	F-YJ	0	6	35
24/05/2005	3:03pm	Single groom	F-YJ	3	39	10
23/05/2005	4:07pm	Single groom	F-YJ	0	54	19
23/05/2005	4:07pm	Single groom	F-YJ	1	1	65
23/05/2005	4:07pm	Single groom	F-YJ	2	3	87
21/05/2005	4:11pm	Single groom	F-YJ	17	51	48
23/05/2005	4:12pm	Single groom	F-YJ	1	0	44
21/05/2005	4:27pm	Single groom	F-YJ	1	8	56
21/05/2005	4:39pm	Single groom	F-YJ	0	30	81
24/05/2005	9:56am	Single groom	F-YJ	1	1	94
7/08/2005	1:58pm	Single groom	F-YI	1	42	9

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
5/08/2005	12:44pm	Single groom	F-YI	1	51	34
18/05/2005	2:26pm	Single groom	F-YI	0	17	85
1/08/2005	2:33pm	Single groom	F-YI	0	5	21
1/08/2005	3:35pm	Single groom	F-YI	1	55	6
25/05/2005	11:10am	Single groom	F-YF	0	20	22
12/05/2005	10:25am	Single groom	F-SA(NI)	0	39	12
19/05/2005	1:27pm	Single groom	F-SA	0	28	4
26/10/2005	2:19pm	Single groom	F-SA	11	54	93
18/12/2005	3:09pm	Single groom	F-SA	0	36	44
1/05/2005	9:13am	Single groom	F-SA	2	2	15
11/04/2005	12:01pm	Single groom	F-OSA(NI)	5	19	88
19/05/2005	11:38am	Single groom	F-OSA	0	55	50
19/05/2005	2:50pm	Single groom	F-OSA	3	45	31
22/07/2005	4:13pm	Single groom	F-OSA	0	59	3

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
1/08/2005	2:43pm	Single groom	F-ONI/YJ	0	28	17
24/07/2005	1:12pm	Single groom	F-ONI	1	44	27
25/07/2005	10:20am	Single groom	F-ONI	1	59	19
28/07/2005	2:09pm	Single groom	F-ONI	0	40	59
28/07/2005	2:10pm	Single groom	F-ONI	0	16	47
3/01/2006	10:37am	Single groom	F-OJ(NI)	2	9	91
20/04/2006	11:10am	Single groom	F-OJ(NI)	1	55	72
18/12/2005	12:01pm	Single groom	F-OJ	17	58	25
25/07/2005	2:02pm	Single groom	F-OJ	4	51	50
30/04/2005	3:51pm	Single groom	F-OI/YJ	0	21	9
9/12/2005	1:46pm	Single groom	F-OI	1	51	96
18/12/2005	1:48pm	Single groom	F-OI	1	43	91
18/12/2005	1:51pm	Single groom	F-OI	0	42	62
19/04/2006	10:30am	Single groom	F-OI	4	28	78
30/11/2005	10:37am	Single groom	F-OI	1	16	85

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
15/04/2006	10:37am	Single groom	F-OI	1	25	37
23/04/2006	11:01am	Single groom	F-OI	0	31	68
17/04/2006	11:11am	Single groom	F-OI	0	36	69
17/10/2005	11:26am	Single groom	F-OI	0	18	63
1/12/2005	11:45am	Single groom	F-OI	4	45	18
6/12/2005	11:46am	Single groom	F-OI	4	32	65
19/12/2005	11:47am	Single groom	F-OI	0	32	43
30/12/2005	12:18pm	Single groom	F-OI	0	21	88
6/12/2005	2:16pm	Single groom	F-OI	0	7	3
22/04/2006	2:19pm	Single groom	F-OI	1	21	19
3/05/2005	3:53pm	Single groom	F-OI	0	35	44
3/05/2005	3:54pm	Single groom	F-OI	1	21	16
3/05/2005	3:57pm	Single groom	F-OI	0	38	12

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
24/05/2005	1:30pm	Single groom	F-NI	1	1	97
24/05/2005	1:47pm	Single groom	F-NI	0	59	16
28/04/2006	1:49pm	Single groom	F-NI	1	7	78
24/05/2005	1:50pm	Single groom	F-NI	0	46	59
28/04/2006	1:50pm	Single groom	F-NI	0	28	81
4/05/2005	1:55pm	Single groom	F-NI	0	11	22
4/05/2005	1:55pm	Single groom	F-NI	0	15	94
23/05/2005	10:37am	Single groom	F-NI	0	27	62
13/04/2006	10:39am	Single groom	F-NI	0	15	3
23/05/2005	10:45am	Single groom	F-NI	0	4	19
11/04/2005	10:54am	Single groom	F-NI	2	9	63
25/05/2005	11:01am	Single groom	F-NI	0	55	38
20/04/2006	11:06am	Single groom	F-NI	0	23	69
19/05/2005	11:10am	Single groom	F-NI	0	15	16

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
25/05/2005	11:10am	Single groom	F-NI	0	49	19
5/05/2005	11:22am	Single groom	F-NI	1	23	94
20/04/2006	11:34am	Single groom	F-NI	0	42	57
19/05/2005	11:41am	Single groom	F-NI	1	27	3
19/05/2005	11:49am	Single groom	F-NI	1	26	47
18/05/2005	12:22pm	Single groom	F-NI	0	45	31
16/04/2006	12:39pm	Single groom	F-NI	0	28	25
11/04/2005	12:41pm	Single groom	F-NI	1	3	10
24/05/2005	2:18pm	Single groom	F-NI	1	2	84
17/04/2006	3:43pm	Single groom	F-NI	1	57	9
18/04/2006	4:06pm	Single groom	F-NI	0	37	45
28/05/2005	9:37am	Single groom	F-NI	1	16	37
12/05/2005	9:43am	Single groom	FM-F(I)	0	34	43
5/05/2005	1:10pm	Single groom	F-M	1	51	94

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
28/11/2005	10:07am	Single groom	F-M	0	53	9
2/05/2005	10:35am	Single groom	F-M	1	40	0
2/11/2005	11:16am	Single groom	F-M	8	6	84
30/04/2005	11:32am	Single groom	F-M	5	18	64
30/04/2005	11:51am	Single groom	F-M	2	37	86
14/04/2006	11:58am	Single groom	F-M	1	47	6
24/10/2005	12:18pm	Single groom	F-M	0	24	97
16/04/2006	12:24pm	Single groom	F-M	1	26	69
20/04/2005	2:07pm	Single groom	F-M	1	0	72
12/05/2005	2:10pm	Single groom	F-M	1	45	15
18/12/2005	2:32pm	Single groom	F-M	4	20	79
18/12/2005	2:37pm	Single groom	F-M	0	39	0
18/12/2005	3:08pm	Single groom	F-M	0	18	13

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
3/05/2005	3:11pm	Single groom	F-M	1	8	9
3/05/2005	3:15pm	Single groom	F-M	0	30	34
3/05/2005	3:15pm	Single groom	F-M	0	42	47
10/10/2005	3:21pm	Single groom	F-M	3	47	28
22/04/2006	3:43pm	Single groom	F-M	4	8	3
3/05/2005	3:45pm	Single groom	F-M	4	7	0
3/05/2005	3:45pm	Single groom	F-M	0	42	63
12/04/2005	9:02am	Single groom	F-M	2	12	62
29/04/2006	9:03am	Single groom	F-M	0	53	37
16/04/2006	9:49am	Single groom	F-M	6	49	73
8/12/2005	9:54am	Single groom	F-M	0	27	16
6/12/2005	9:59am	Single groom	F-M	1	24	34
24/07/2005	1:16pm	Single groom	F-J	2	33	90
25/07/2005	10:20am	Single groom	F-J	4	42	6

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
23/05/2005	10:26am	Single groom	F-J	5	38	48
31/10/2005	12:01pm	Single groom	F-J	4	15	50
13/04/2006	12:57pm	Single groom	F-J	7	11	25
26/10/2005	2:02pm	Single groom	F-J	15	18	6
2/05/2005	3:46pm	Single groom	F-J	6	17	88
5/05/2005	11:19am	Single groom	F-I	0	56	93
2/05/2005	12:19pm	Single groom	F-I	0	57	84
24/04/2006	12:55pm	Single groom	F-I	4	52	0
24/05/2005	3:59pm	Single groom	F-I	1	0	53
8/05/2005	4:29pm	Single groom	F-I	1	45	13
8/06/2005	4:29pm	Single groom	F-I	1	45	13
8/05/2005	4:59pm	Single groom	F-I	1	25	81
8/06/2005	5:07pm	Single groom	F-I	1	25	81
3/05/2005	9:43am	Single groom	F-I	2	29	78

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
21/05/2005	4:08pm	Single groom	F-F(YJ)	0	21	10
7/08/2005	3:22pm	Single groom	F-F(YI)	0	41	85
24/07/2005	11:30am	Single groom	F-F(ONI)	1	58	75
22/04/2006	10:19am	Single groom	F-F(OI)	0	5	28
22/04/2006	10:30am	Single groom	F-F(OI)	0	19	41
30/11/2005	11:51am	Single groom	F-F(OI)	0	50	19
22/04/2006	1:24pm	Single groom	F-F(NI)	2	19	69
20/05/2005	1:31pm	Single groom	F-F(NI)	5	7	22
4/05/2005	1:51pm	Single groom	F-F(NI)	0	41	0
4/05/2005	1:55pm	Single groom	F-F(NI)	0	34	34
24/05/2005	10:56am	Single groom	F-F(NI)	9	5	53
19/05/2005	11:54am	Single groom	F-F(NI)	1	3	25
19/05/2005	11:54am	Single groom	F-F(NI)	0	11	66
2/05/2005	12:04pm	Single groom	F-F(NI)	3	55	0

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
24/04/2006	12:45pm	Single groom	F-F(NI)	4	33	87
22/04/2006	2:03pm	Single groom	F-F(NI)	2	41	63
20/05/2005	2:24pm	Single groom	F-F(NI)	0	12	28
30/04/2005	2:28pm	Single groom	F-F(NI)	1	12	56
30/04/2005	3:08pm	Single groom	F-F(NI)	2	46	88
18/04/2006	3:10pm	Single groom	F-F(NI)	4	11	37
22/04/2006	3:35pm	Single groom	F-F(NI)	0	27	82
21/05/2005	3:46pm	Single groom	F-F(NI)	0	9	97
23/04/2006	4:13pm	Single groom	F-F(NI)	0	10	28
23/05/2005	4:14pm	Single groom	F-F(NI)	9	53	90
30/04/2005	4:19pm	Single groom	F-F(NI)	0	48	34
1/05/2005	6:34am	Single groom	F-F(NI)	0	40	77
19/04/2006	9:27am	Single groom	F-F(NI)	3	51	26
19/04/2006	9:57am	Single groom	F-F(NI)	1	6	9

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
2/05/2005	12:04pm	Single groom	F-F(I)	2	42	25
28/07/2005	1:34pm	Single groom	F-F	7	25	91
22/04/2006	10:04am	Single groom	F-F	0	18	87
22/04/2006	10:05am	Single groom	F-F	4	53	3
22/04/2006	10:11am	Single groom	F-F	0	46	60
19/05/2005	10:29am	Single groom	F-F	0	20	28
26/04/2006	10:41am	Single groom	F-F	2	2	69
26/04/2006	10:44am	Single groom	F-F	2	41	22
19/05/2005	11:12am	Single groom	F-F	3	42	22
2/01/2006	11:23am	Single groom	F-F	0	3	85
19/05/2005	11:46am	Single groom	F-F	1	41	25
19/05/2005	11:59am	Single groom	F-F	0	17	87
19/05/2005	12:02pm	Single groom	F-F	4	9	9
29/04/2006	12:10pm	Single groom	F-F	0	53	41

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
23/05/2005	12:11pm	Single groom	F-F	1	23	38
24/05/2005	2:20pm	Single groom	F-F	0	13	84
24/04/2006	2:39pm	Single groom	F-F	0	25	59
22/04/2006	2:44pm	Single groom	F-F	7	40	75
24/05/2005	3:35pm	Single groom	F-F	3	3	84
24/05/2005	3:52pm	Single groom	F-F	2	39	50
22/04/2006	4:06pm	Single groom	F-F	4	54	88
30/04/2005	4:15pm	Single groom	F-F	1	24	83
1/05/2005	6:45am	Single groom	F-F	4	14	86
21/05/2005	1:04pm	Single groom	F(YJ)-YSA(NI)	1	12	55
21/05/2005	1:24pm	Single groom	F(YJ)-YSA	0	48	6
20/05/2005	10:18am	Single groom	F(YJ)-J	0	31	25
20/05/2005	9:59am	Single groom	F(YJ)-J	1	45	12
24/07/2005	10:38am	Single groom	F(ONI)-YF	1	49	22

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
30/10/2005	2:56pm	Single groom	F(OI/YJ)-M	3	45	66
30/11/2005	1:32pm	Single groom	F(OI)-J	2	37	7
9/11/2005	12:52pm	Single groom	F(OI)-F(OI)	2	50	15
14/04/2006	11:14am	Single groom	F(OI) - F	2	1	69
26/04/2006	11:21am	Single groom	F(OI) - F	0	13	37
26/04/2006	11:46am	Single groom	F(OI) - F	3	2	82
26/04/2006	11:50am	Single groom	F(OI) - F	1	28	69
16/04/2006	9:58am	Single groom	F(OI) - F	2	25	4
25/05/2005	11:10am	Single groom	F(NI)-YF	0	45	3
18/05/2005	11:54am	Single groom	F(NI)-SA	1	17	44
18/05/2005	11:59am	Single groom	F(NI)-SA	1	18	78
24/05/2005	3:12pm	Single groom	F(NI)-SA	1	45	25
4/05/2005	10:15am	Single groom	F(NI)-OJ	1	39	47
4/05/2005	10:27am	Single groom	F(NI)-OJ	2	25	88

Date	**Time***	**Behav. events**	**Initiator - Recipient**	**Duration of event**		
				minutes	**seconds**	**split seconds**
26/04/2006	10:28am	Single groom	F(NI)-M	0	32	40
30/04/2005	12:01pm	Single groom	F(NI)-M	3	45	43
30/04/2005	12:04pm	Single groom	F(NI)-M	1	20	15
26/04/2006	2:56pm	Single groom	F(NI)-M	2	4	81
22/05/2005	10:09am	Single groom	F(NI)-J	1	5	88
22/05/2005	10:10am	Single groom	F(NI)-J	0	20	60
11/04/2005	11:15am	Single groom	F(NI)-J	6	25	88
28/07/2005	11:57am	Single groom	F(NI)-J	2	37	3
11/04/2005	2:39pm	Single groom	F(NI)-FM	3	43	16
11/04/2005	2:39pm	Single groom	F(NI)-FM	0	31	47
6/05/2005	2:39pm	Single groom	F(NI)-FM	0	31	47
17/04/2006	1:58pm	Single groom	F(NI)-F(OI)	12	2	62
5/05/2005	11:34am	Single groom	F(NI)-F(NI)	3	9	0

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
4/05/2005	1:55pm	Single groom	F(NI)-F	0	35	57
11/04/2005	10:35am	Single groom	F(NI)-F	1	56	88
11/04/2005	10:36am	Single groom	F(NI)-F	0	30	65
19/05/2005	10:36am	Single groom	F(NI)-F	2	3	50
11/04/2005	10:55am	Single groom	F(NI)-F	2	3	55
11/04/2005	10:55am	Single groom	F(NI)-F	0	10	72
30/04/2005	11:15am	Single groom	F(NI)-F	0	8	12
22/05/2005	11:27am	Single groom	F(NI)-F	1	55	72
22/05/2005	2:48pm	Single groom	F(NI)-F	3	10	67
30/04/2005	2:53pm	Single groom	F(NI)-F	2	47	24
30/04/2005	2:53pm	Single groom	F(NI)-F	1	29	62
23/04/2006	4:15pm	Single groom	F(NI)-F	0	57	40
30/04/2005	4:23pm	Single groom	F(NI)-F	3	17	47
19/05/2005	1:01pm	Single groom	F(NI) -M	3	59	9

Date	Time*	Behav. events	Initiator - Recipient	Duration of event		
				minutes	seconds	split seconds
22/05/2005	10:26am	Single groom	F(NI)- J	1	38	90
6/05/2005	2:38pm	Single groom	F(NI)- FM	3	43	16
18/04/2006	3:15pm	Single groom	F(NI) - SA	3	7	75
18/04/2006	1:04pm	Single groom	F(NI) - F(OI)	1	31	91
20/04/2006	10:48am	Single groom	F(NI) - F(NI)	0	11	87
18/04/2006	1:26pm	Single groom	F(NI) - F	0	35	16
13/04/2006	12:52pm	Single groom	F(NI) - F	2	34	44
17/04/2006	3:51pm	Single groom	F(NI) - F	3	30	53
20/04/2006	3:51pm	Single groom	F(NI) - F	0	33	34
6/12/2005	12:27pm	Single groom	F-(J-OJ)	2	44	31
21/05/2005	11:28am	Single groom	F(I)-J	0	38	2
2/05/2005	12:18pm	Single groom	F(I)-F(NI)	2	8	85
26/04/2006	11:00am	Single groom	F - SA	2	3	7
1/01/2006	11:38am	Single groom	F - OI	1	39	88

Date	**Time***	**Behav. events**	**Initiator - Recipient**	**Duration of event**		
				minutes	**seconds**	**split seconds**
19/04/2006	11:25am	Single groom	F - M	1	27	0
18/04/2006	12:27pm	Single groom	F - M	0	35	69
29/04/2006	10:55am	Single groom	F - J	5	12	45
29/04/2006	11:04am	Single groom	F - J	0	6	47
20/04/2006	12:30pm	Single groom	F - F	5	36	82
14/04/2006	3:07pm	Single groom	F - F	6	3	47
17/04/2006	3:31pm	Single groom	F - F	2	26	92

*Based on closest time check or approximate time between two time checks in focal data collection)

Code: () embrace

UKI = Unknown initator

? = Unknown individual